JULY 25, 1931

Railway Age

Founded In 1856

GENEVA COLLEGE LIBRARY,
No.
BEAVER

Timken Bearings keep train mileage up and train mile costs down

Trains must make mileage or they cannot make profits. Delays decrease mileage and increase mileage costs. The higher the speed and the longer the run, the greater the value of Timken Bearings. *No hot boxes.*

The Timken Roller Bearing Company, Canton, Ohio

TIMKEN *Tapered Roller* **BEARINGS**

Alphabetical Index to Advertisers—Page 54

Buyers Directory of Advertisers—Page 47

Southern Pine Poles 1st Again with a 21% Increase

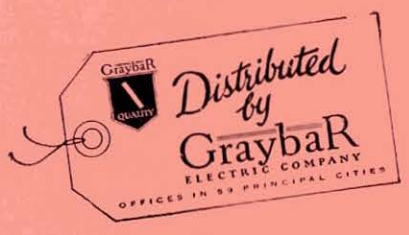
1930 MARKS the fourth consecutive year that Southern Pine Poles have led the field of treated poles. The total number of poles treated for the year was 4,276,031* of which

2,428,173

were Southern Pine Poles. Think of it. More Pine Poles treated in 1930 than the combined number of all other treated poles. But that is not all. Creosoted Pine *increased* 21% in a year when the total number of treated poles decreased 107,737 and the nearest other pole species showed a decrease of 17%.

What does it all mean? Simply this. Pole users are rapidly turning to Creosoted Pine. It has become the country's foundation pole; territories far from the source of supply now find it more economical to use pine. Why? Because it has greatest lasting strength, longest life, safest for service and costs least per year. Proof? ***International*** has Creosoted Pine Poles in service 20-25-30 years and these are still strong.

**From Forest Service, U. S. Department of Agriculture in co-operation with the American Wood Preservers' Association.*



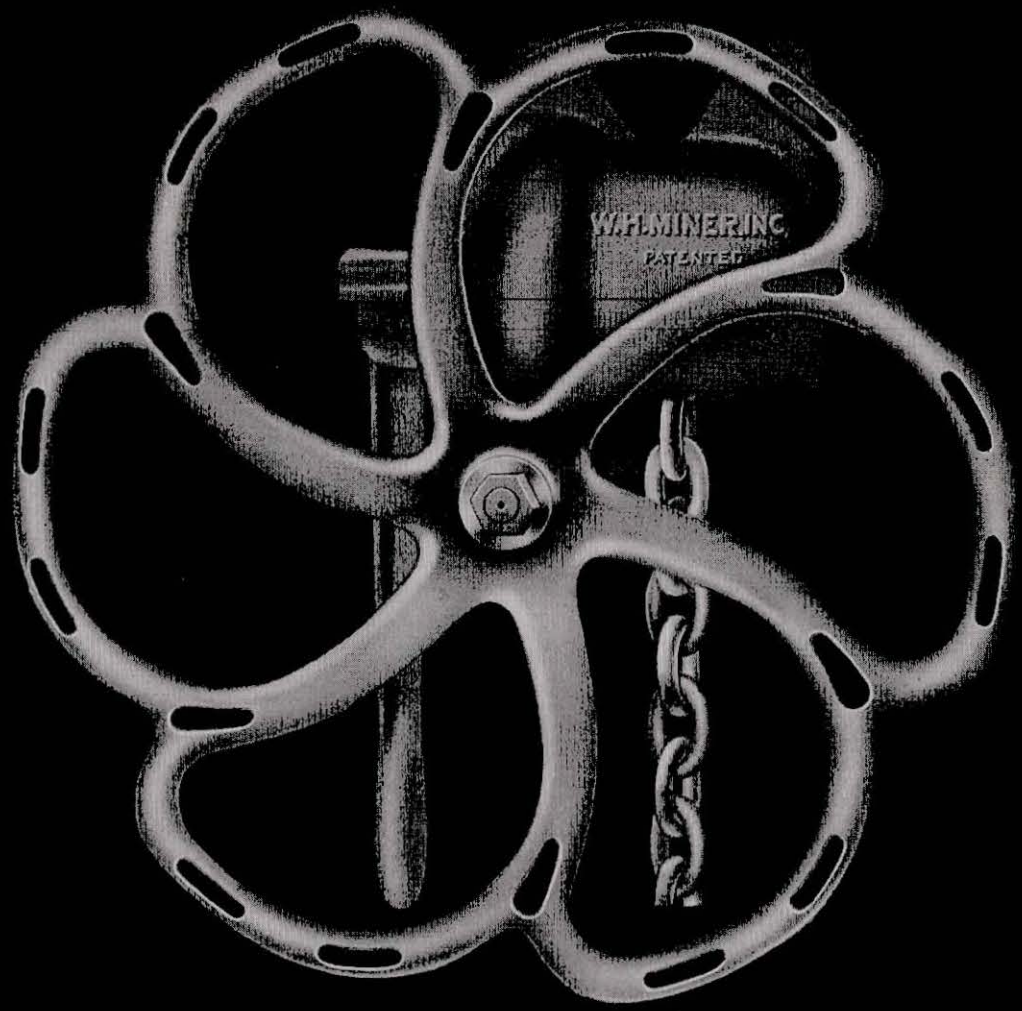
International Creosoting & Construction Co.
General Office—Galveston, Texas
Plants: Texarkana — Beaumont — Galveston

International Creosoted Yellow Pine Poles

Published weekly by Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa. Entered as second class matter, March 9, 1928, at the Post Office at East Stroudsburg, Pa., under the act of March 3, 1879.
Address communications to 30 Church St., New York City.

MINER

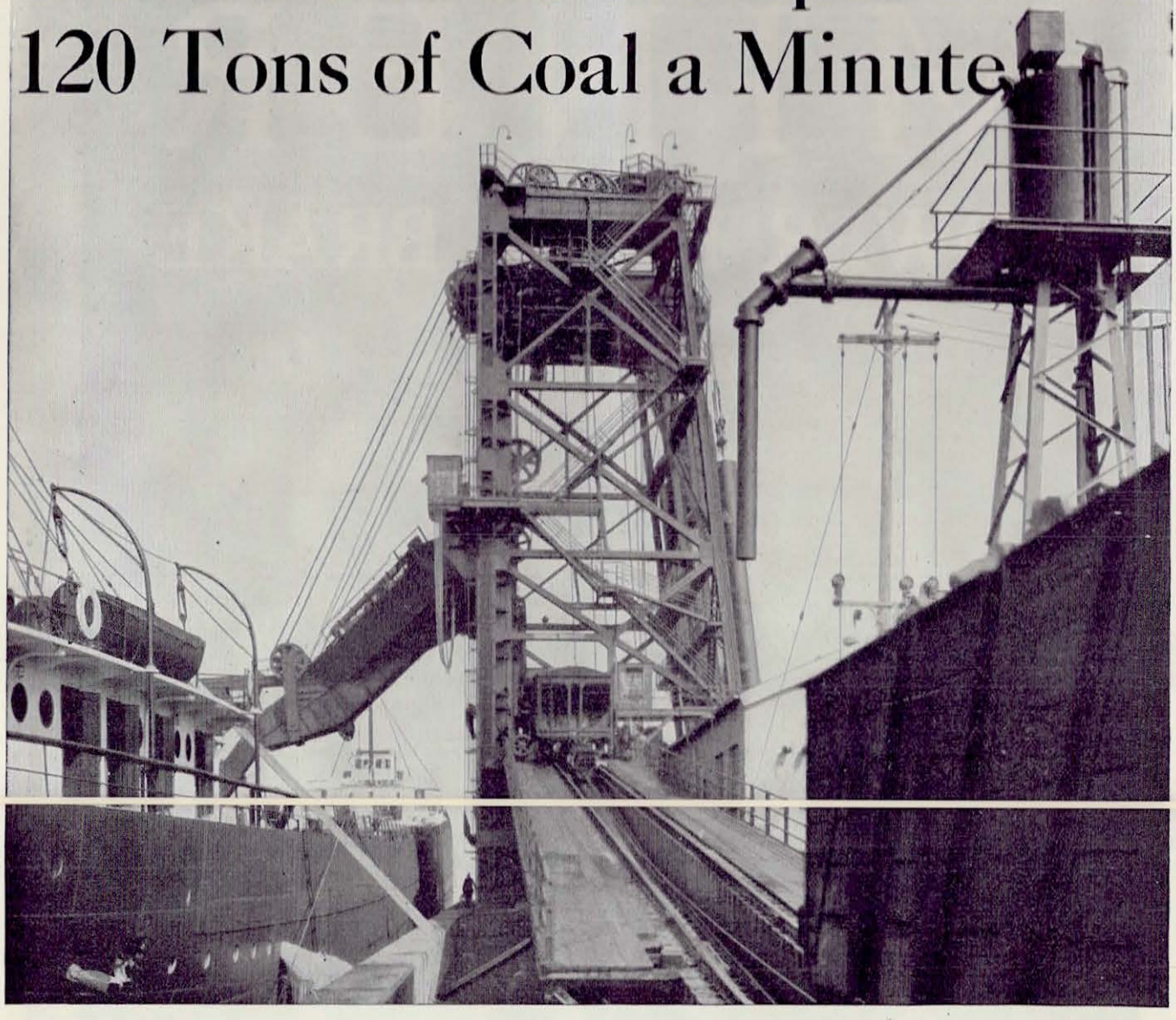
POWER HAND BRAKE



Embodies Highest Standards of Safety, Power and Efficiency

W. H. MINER, INC. CHICAGO

This Giant Car Dumper Loads 120 Tons of Coal a Minute



If you should be near Toledo, Ohio, when the lake season is open, you would wonder what happens to the long trains of heavily loaded coal cars which draw steadily into the new Presque Isle dock of the Chesapeake and Ohio Railway. Let us stop for a moment and find out.

Towering over the boats being loaded at the water's edge stand two Industrial Brownhoist electric high-lift car dumpers, like the one shown above. Now watch one of them pick up a car holding 120 tons of coal, rotate and dump it and place it back empty on the track. Each dumper will complete a cycle a minute, the boats being quickly loaded for up the lakes.

The tremendous savings in the above operation are obvious, but proportional economies are being made by Industrial Brownhoist cranes in nearly every line of industry. You have only to call in our nearby representative to learn whether these economies can be applied to your own handling work.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia. Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

INDUSTRIAL BROWNHOIST

Published every Saturday by the Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa., with executive offices at 30 Church Street, New York

All communications should be addressed to the New York Office 30 Church Street

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Lucius B. Sherman, *Vice-Pres.*
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SAN FRANCISCO
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Railway Age

With which are incorporated the Railway Review, the Railroad Gazette and the Railway Age-Gazette. Name Registered U. S. Patent Office

Vol. 91 July 25, 1931 No. 4

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Making Steam Locomotives Beautiful 129

Some suggestions on this subject by O. Kuhler, an engineer with an artistic bent, who maintains that railroads, in their advertising of through-train services, have not taken advantage of the romance surrounding the locomotive.

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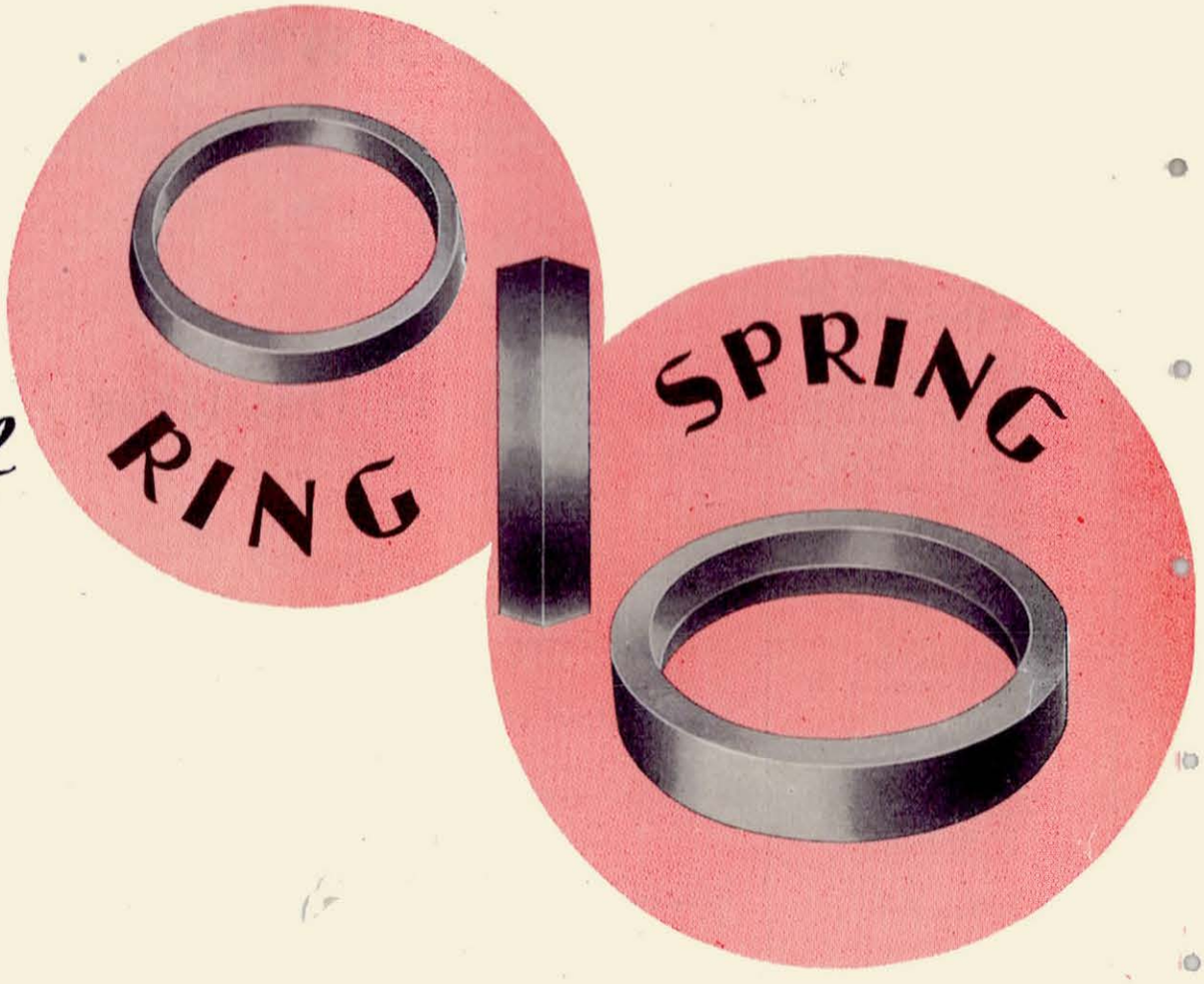
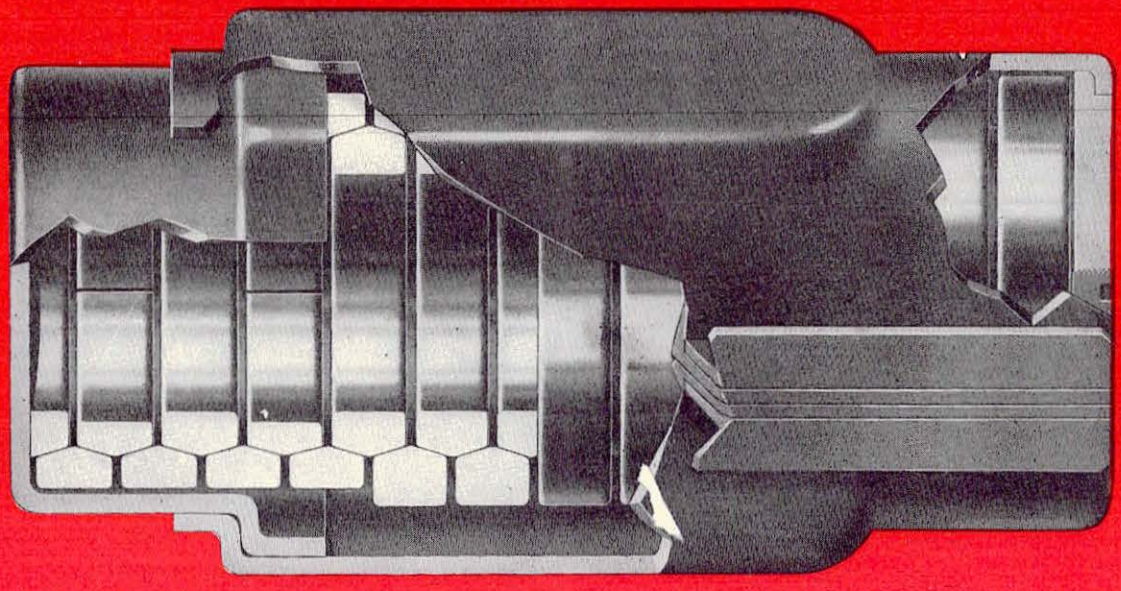


* *Equipment* **PROTECTION** *not heretofore possible*

principle that "makes" the

EDGEWATER



RING SPRING DRAFT GEAR

The Ring Spring Principle—with its uniformity of action, its high endurance—its ability to withstand fatigue—and its Lubrication feature—is today's answer to the demand for a far better draft gear.

You will be interested in our bulletin No. 8—now ready.

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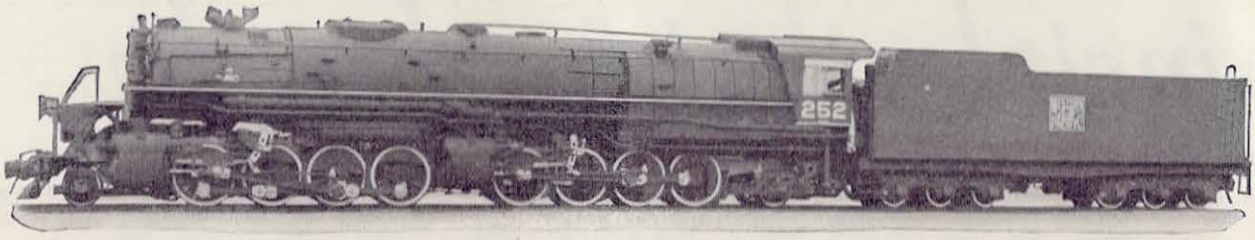
For Fast Freight Service

on the

Western Pacific



2-8-8-2 TYPE LOCOMOTIVE
WESTERN PACIFIC RAILROAD

Cylinders (4)	26″ x 32″
Drivers, diameter	63″
Steam pressure	235 lb.
Grate area	145 sq. ft.
Water heating surface	6880 sq. ft.
Superheating surface	2152 sq. ft.
Weight on drivers	552,700 lb.
Weight, total engine	665,100 lb.
Tractive force, main cylinders	137,000 lb.
Tractive force, with booster	150,900 lb.

THE WESTERN PACIFIC handles a large tonnage of freight, particularly fruits and vegetables, which moves on fast schedules.

To maintain the speed and to permit the handling of trains without helpers, this Railroad is placing in service six single-expansion oil burning Mallet locomotives of the 2-8-8-2 type built by The Baldwin Locomotive Works.

These are high-power locomotives capable of hauling greater tonnage, at a sustained high speed, than locomotives now in use. They were especially designed to meet operating problems on the line of the Western Pacific in the Feather River Canyon of the Sierra Nevada Mountains.

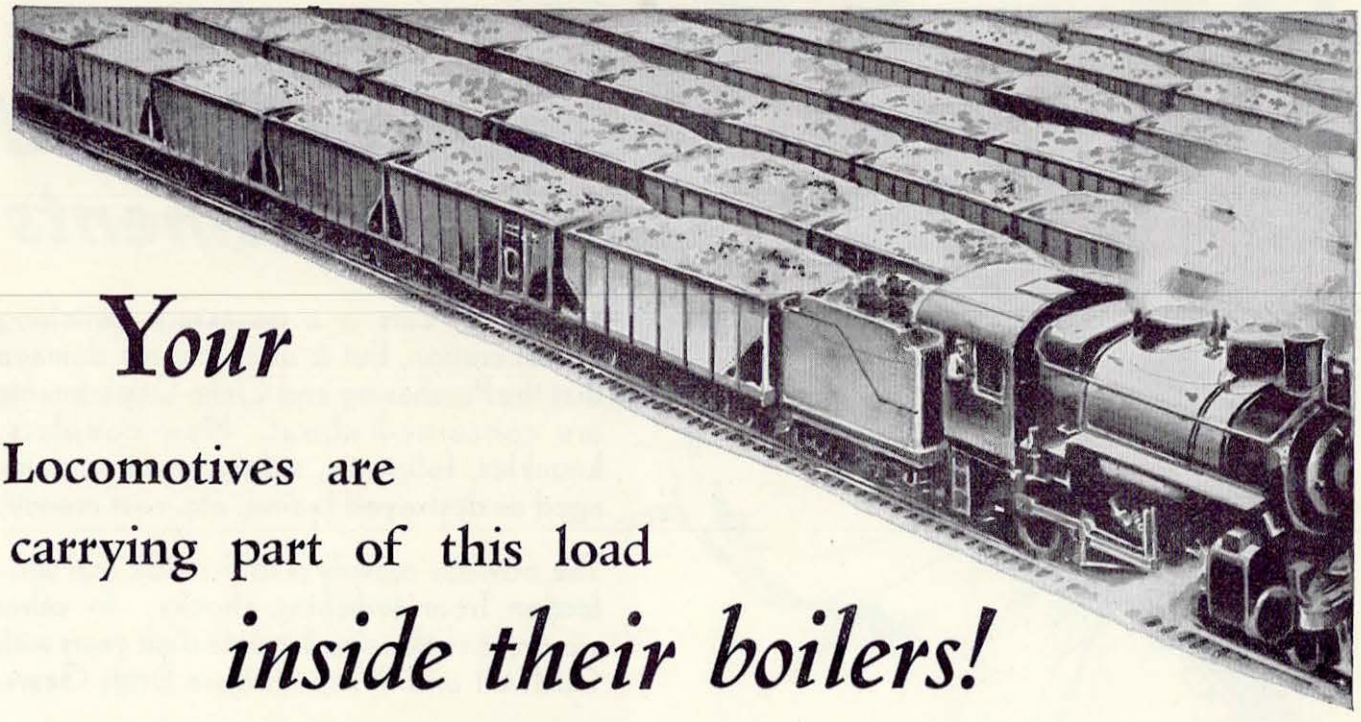
These locomotives are among the most notable of this type recently built.

THE BALDWIN LOCOMOTIVE WORKS ★ 1831 1931

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

2,500 *cars of* BOILER SCALE



Your Locomotives are carrying part of this load *inside their boilers!*

LOCOMOTIVES in active service today are carrying scale in their boilers, which, if piled into freight cars, would make a long and heavy load. It is estimated that 250,000,000 pounds of scale are fed into locomotive boilers yearly—over 2,500 carloads! This enormous load (at 13c a pound, the generally accepted figure) is costing our roads $32,500,000 annually!

Eliminate boiler scale and you are rid of these tremendous overhead charges. Locomotive shoppings are greatly reduced—fuel consumption drops materially. Aside from distillation, which is far too expensive for railway use, there is only one method that completely prevents scale, sludge and mud—the zeolite method.

• • •

Write for authoritative data—"Soft Water for Railroads," written by a railroad man and based on actual performance records. It will be sent without obligating you.

THE PERMUTIT COMPANY
440 FOURTH AVENUE, NEW YORK

Manufacturers of all types of Zeolite, Hot and Cold Lime Soda, Lime-Barium Water Softeners—Sand Filters—Iron, Oil and Manganese Removing Filters—Continuous Boiler Blowoff Equipment—Ranarex CO_2 Indicators and Recorders—Other Power Plant and Water Treating Specialties.

Permutit *Water Treating Equipment*

TWENTY-THREE SALES OFFICES THROUGHOUT THE UNITED STATES

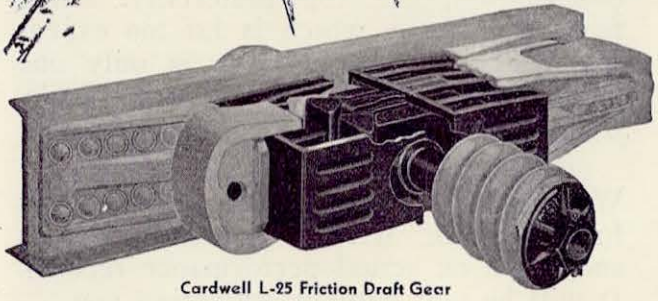
a KICK like this

is felt in the purchasing and claim departments

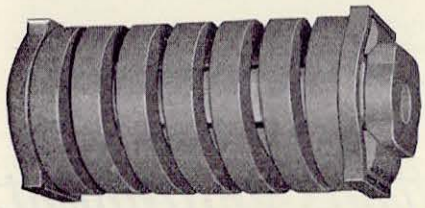
"KICKING" cars is a necessary switching operation, but it often causes damage that the Purchasing and Claim Departments are concerned about. New couplers, knuckles, followers, siding, roofing, damaged or destroyed lading, etc. *cost money.*

The obvious remedy is to provide *real* protection from switching shocks. In other words, to replace inadequate draft gears with Cardwell and Westinghouse Draft Gears.

CARDWELL WESTINGHOUSE CO.
332 S. Michigan Ave. Chicago, Illinois
PITTSBURGH, PENNSYLVANIA
MONTREAL, QUEBEC, CANADA



Cardwell L-25 Friction Draft Gear



Cardwell Westinghouse Friction Draft Gear Type F-2

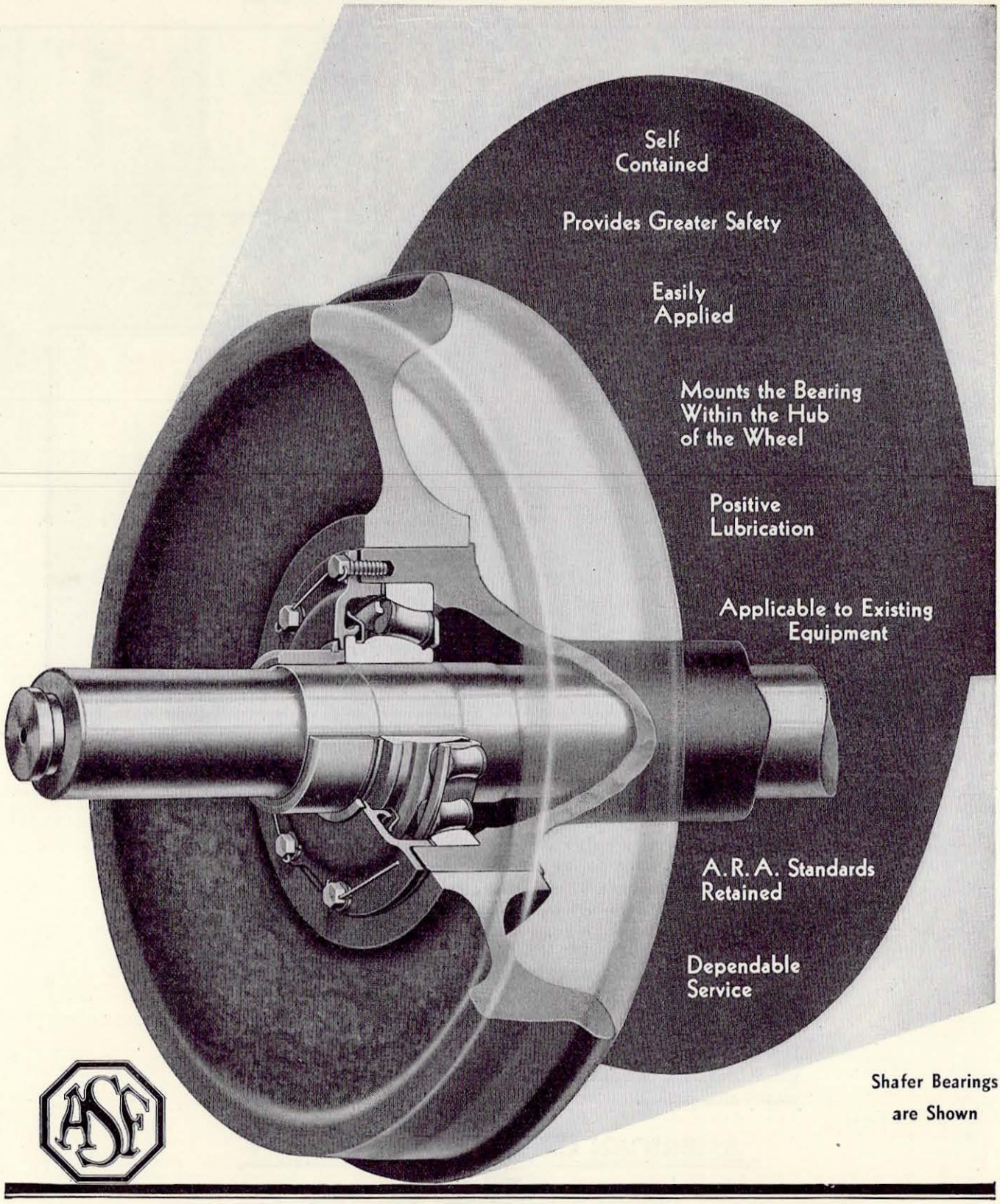
Cardwell Westinghouse Draft Gears

Made in types and designs to fit any kind of car construction or draft gear attachments on new or old equipment, and in sizes and capacities which meet all modern and A. R. A. requirements. » » » »

Westinghouse NY-11-D Friction Draft Gear

GOOD DRAFT GEARS MAKE CARS GO FARTHER

American Steel Foundries Roller Bearing Unit

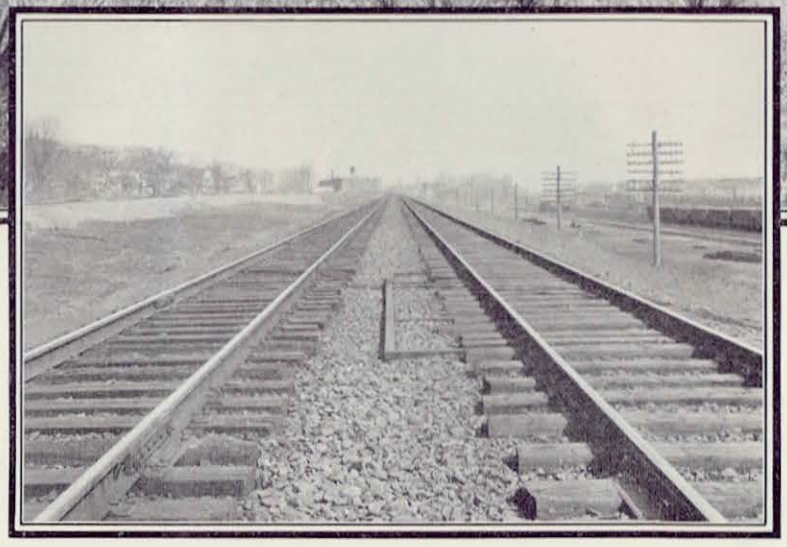


Shafer Bearings are Shown

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Consider these PROVEN FACTS about wood preserving—



The Lowry Process

Service records covering periods of 25 years show the Lowry Process clearly leading in effectiveness of treatment and economy of the treated timber. The reasons for this superiority are clear.

The wood is treated without preliminary air pressure, so there is no initial resistance to the entry of the preservative. This makes for deep and uniform penetration. Pressures are not carried high enough to injure materially the cell walls in the wood. The final vacuum drains out the surplus oil, leaving only the amount desired. Bleeding after treatment is reduced to a minimum. The very large part of the preservative left in the wood is therefore retained indefinitely—increasing the resistance to decay.

In view of the demonstrated advantages to be gained through the Lowry Process, this company has consistently used and recommended it. We will be glad to show you the service records which justify this policy.

AMERICAN CREOSOTING COMPANY
INCORPORATED

COLONIAL CREOSOTING COMPANY INCORPORATED

AMCRECO LOWRY PROCESS CREOSOTED WOOD

GEORGIA CREOSOTING COMPANY INCORPORATED

LOUISVILLE — KENTUCKY

RA 7-25 Gray

»»Smarter PASSENGER TRAIN CARS with Lower Fabrication costs . . .

IF YOU want your passenger train cars to appear trim and attractive through thousands of miles of wear and tear, consider the exceptional qualifications of Armco specially processed sheets.

These smooth, uniform sheets are made expressly for this purpose. They are flat, true to gage, and specially processed to take and hold paint and other finishes. Thirty-one years of experience and an intimate knowledge of the requirements of exacting railroads have gone into their manufacture.

Let any of the offices listed below tell you how Armco sheets have enabled other railroads to achieve enduring beauty and lasting service in their passenger train cars.

•

RAILROAD PRODUCTS

MADE BY CONTINUOUS PROCESS

Special Car Siding Sheets
Locomotive Jacket Sheets
Freight Car Sheets and Plates
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Wrought Steel Wheels

ARMCO RAILROAD SALES CO.

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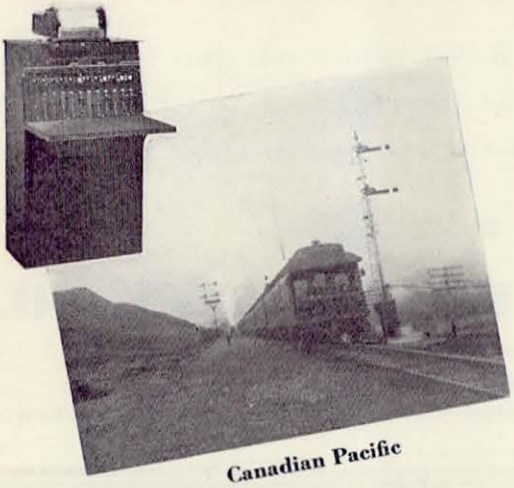
ARMCO
IRON AND STEEL
SHEETS FOR EXACTING RAILROAD USES PLATES

This 4th Anniversary Record Means

Stanley to Berwick Installation



Canadian Pacific

The Stanley to Berwick Centralized Traffic Control Installation marks its fourth anniversary today. Although subsequent installations surpass this one in point of mileage and length of control, it is still outstanding in that it was the first complete installation in the world.

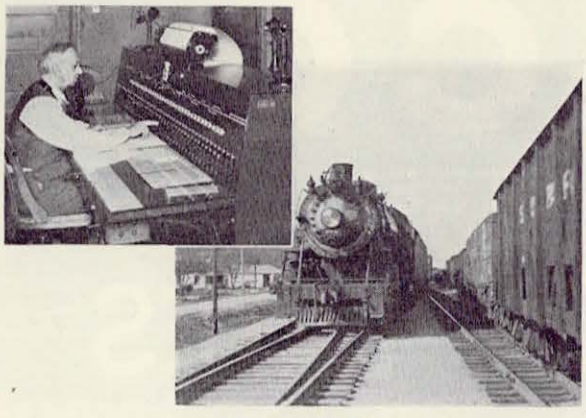
Economic studies on this 40 mile section show:

A 36% increase in freight train speed

A 39% increase in G.T.M. per Train Hour

The institution of non-stop meets.

$128,518 *net saving per annum (24% on the investment) excluding that due to postponement of construction of a second main track.*



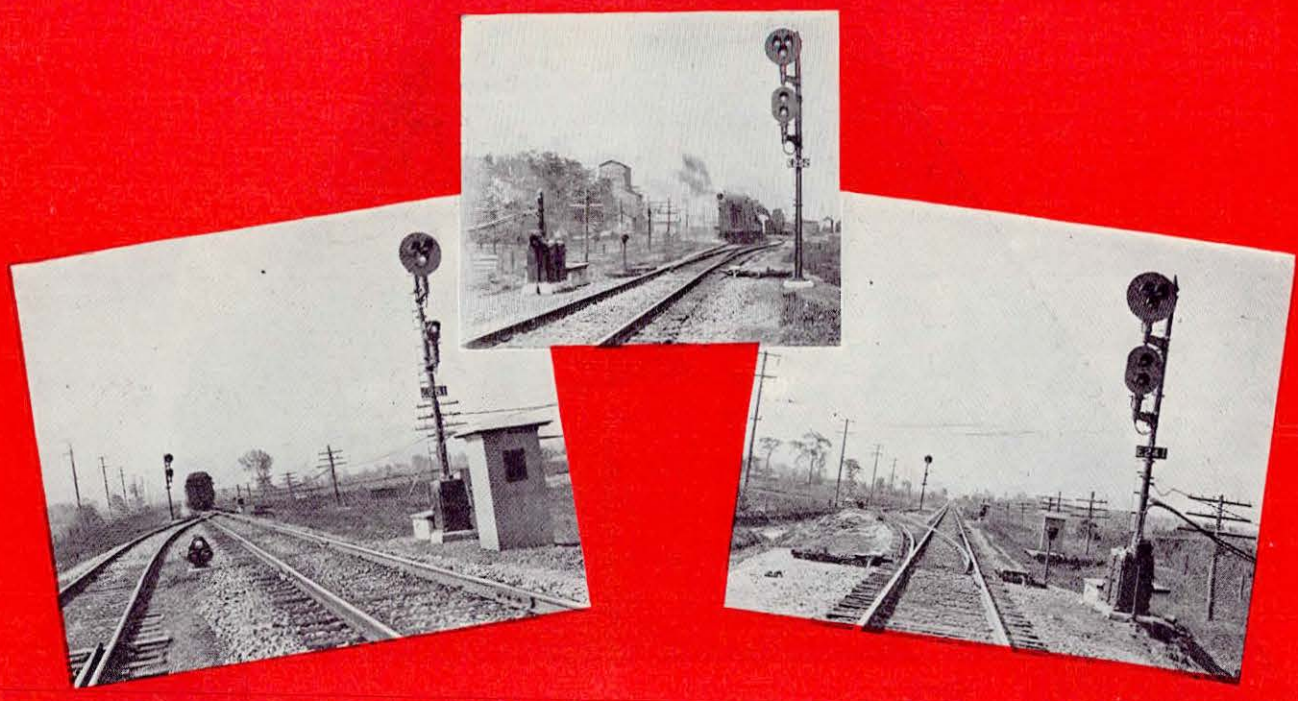
Missouri Pacific

GENERAL RAILWAY

New York Chicago ROCHESTER,

Affiliated Companies' Offices: London Paris Tokyo

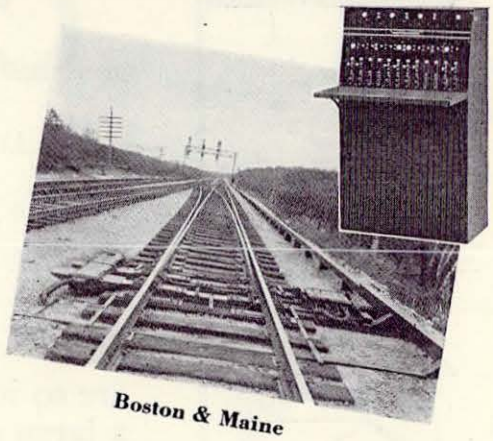
Much to Every Operating Official



Ohio Division, N.Y.C.R.R.

$348,518 net saving per annum (65% on the investment) including that due to postponement of construction of a second main track.

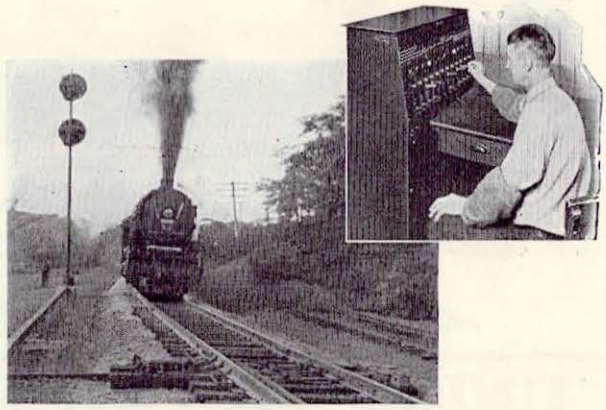
These advantages are not unusual since substantial savings are being realized on each of the G.R.S. installations now in service.



Boston & Maine

59 ac Machines are now in service or on order for 18 railroads; 32 for controlling trains entirely by signal indications on 792 miles of track; and 27 for controlling remote switches or interlocking facilities.

A similar system on your line will mean much to you. Write for our ac series of folders. They will be of interest.



A-848 Lehigh Valley

SIGNAL COMPANY

NEW YORK St Louis Montreal
Barcelona Melbourne Calcutta Buenos Aires

Expensive Carding

Flat plate doors mean frequent carding to rip-tracks.

AJAX
CORRUGATED
DROP DOORS

are so much stronger that they mean a large reduction in rip-track repairs.

UNION METAL PRODUCTS COMPANY

NEW YORK · CHICAGO · ST. LOUIS · WASHINGTON
RICHMOND · HOUSTON · SAN FRANCISCO · KANSAS CITY · MONTREAL

"STANDARD S-302"

High Test Steel for

No Alloys
Prompt Shipments

You will be surprised at the slight increase in costs.

Ask our nearest office to send you specification S-302-31

STANDARD STEEL WORKS COMPANY

General Offices and Works: BURNHAM, PA.

CHICAGO ST. LOUIS PORTLAND
NEW YORK SAN FRANCISCO PHILADELPHIA AKRON

Universal
ONE-HAND BRAKE

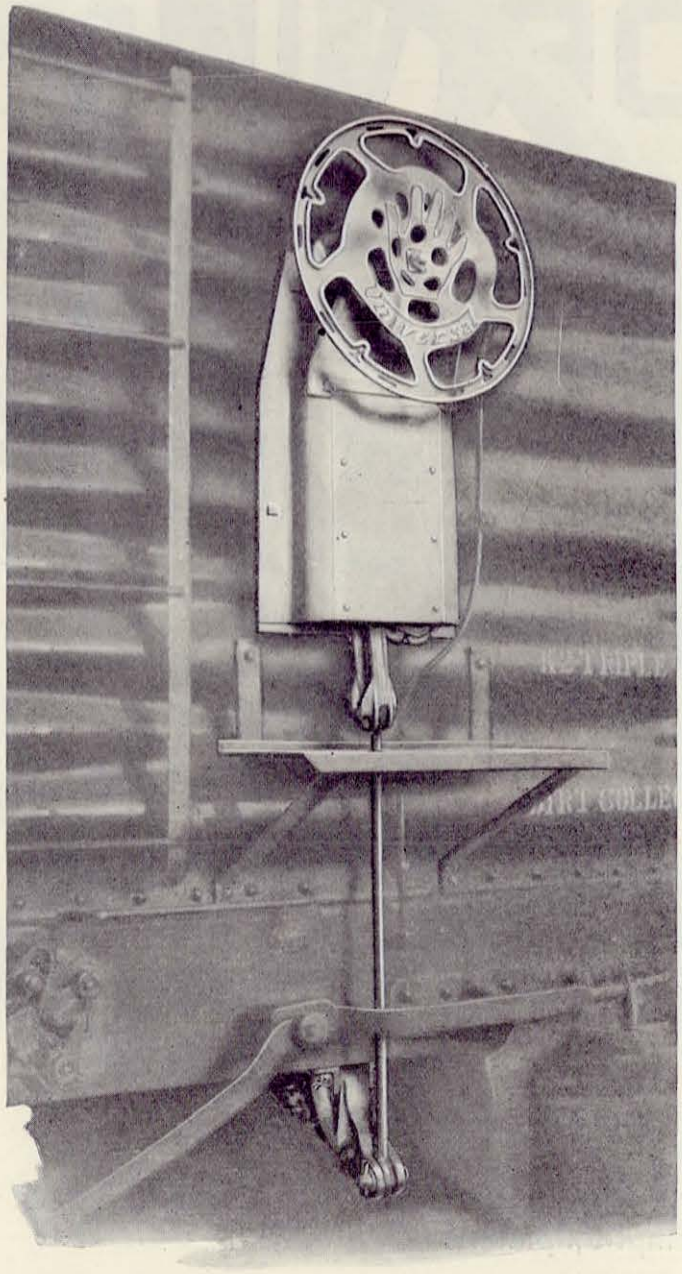
Perfect control of car with ONE HAND, leaving the other hand and both feet free to maintain a SAFE position.

AMPLE POWER without use of gears or other complicated mechanism.

UNIT construction. Easily and economically applied to car without change to Brake Rigging.

Principle Correct—Proven by years of satisfactory service on many thousands of cars.

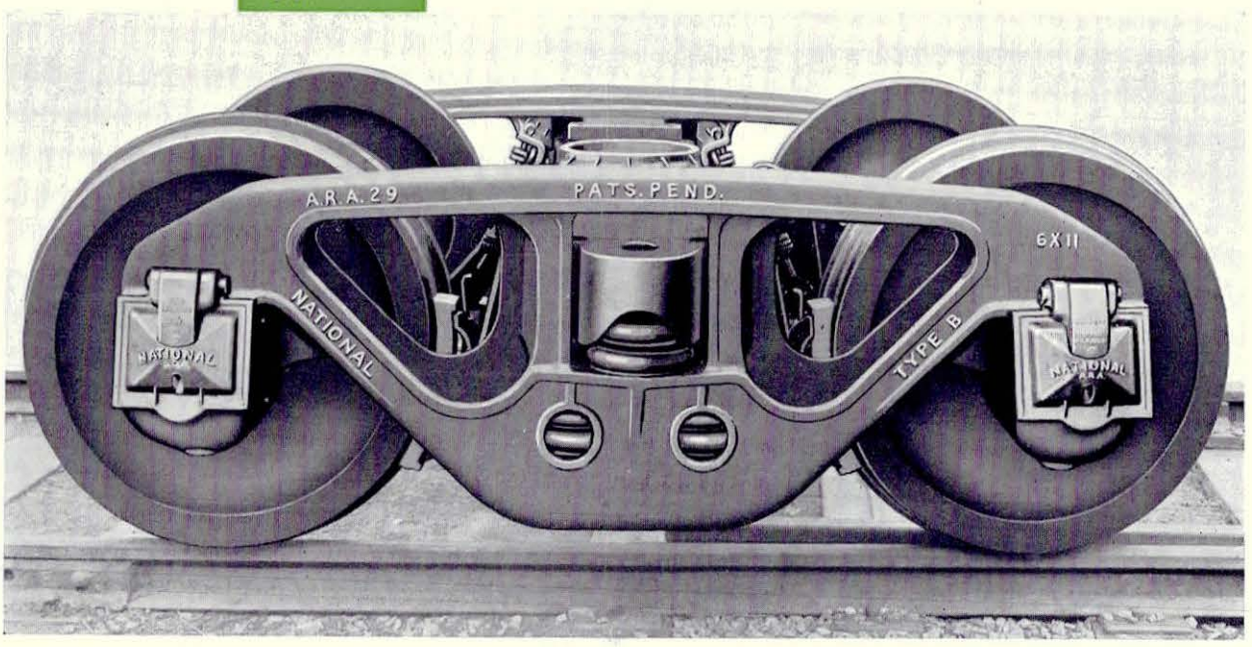
Past performance shows maintenance cost to be practically negligible.



Universal Draft Gear Attachment Co.

332 South Michigan Ave., Chicago

Royal Bank Building, Montreal, Canada



REDUCING CLAIMS

MANY factors work together in modern railroad operation to bring about less and less damage to goods in transit.

Certainly one important factor in this process is the riding qualities of the car—which depend on proper design and construction of the trucks.

National Type B Trucks are designed with substantially increased spring capacity, obtained by the use of Class G springs which provide easier riding qualities in both empty and loaded cars. Detailed information gladly furnished on request.

M17 National Draft Gear. A contribution to profitable freight operation. This gear stands first in the combination of capacity, sturdiness and endurance.

THE NATIONAL MALLEABLE & STEEL CASTINGS CO.

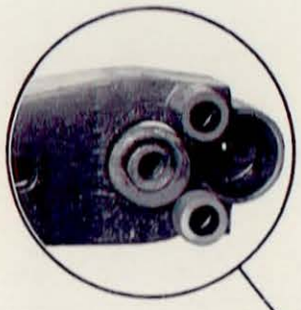
General Offices: CLEVELAND, OHIO

Sales Offices: New York, Philadelphia, Washington, Chicago, St. Louis, San Francisco
Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.

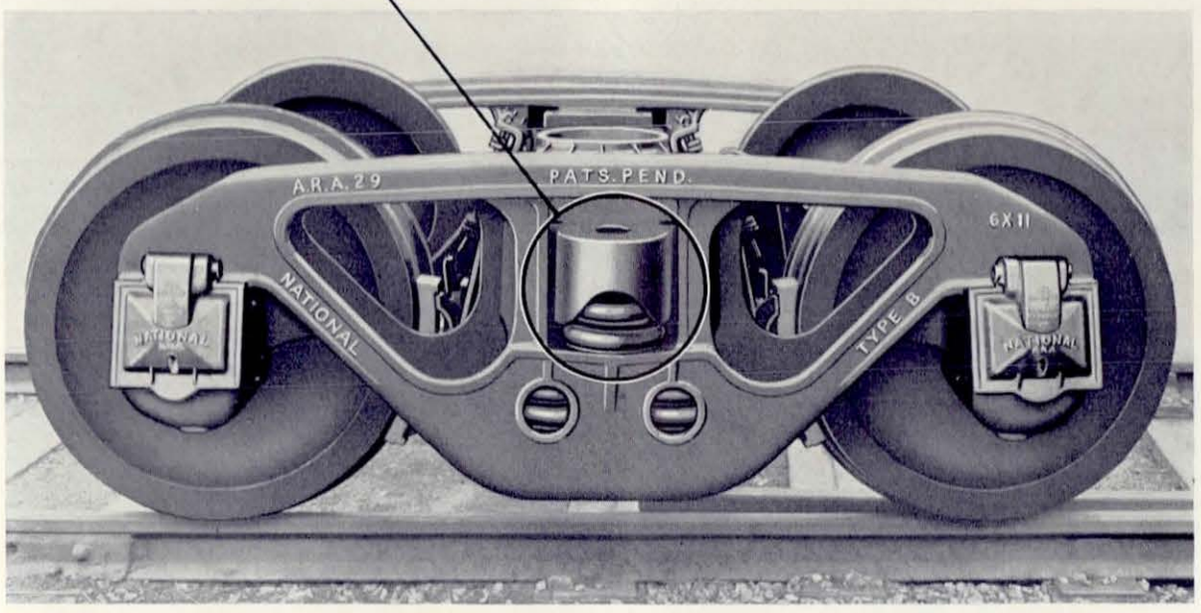
NATIONAL

TYPE (M&S Co.) ··B··

TRUCKS



Showing how two trunnions are cast on each end of the National Type B Truck bolster. These provide a much stronger tie than the regular spring plank.



LIGHTER

NATIONAL Type B Trucks effect a saving in weight of as much as 300 lbs. per car—allowing for an equivalent increase in revenue load.

This saving is obtained by eliminating the spring plank and providing an even stronger and more effective construction for tying the truck frames together.

THE NATIONAL MALLEABLE & STEEL CASTINGS CO.

General Offices: CLEVELAND, OHIO

Sales Offices: New York, Philadelphia, Washington, Chicago, St. Louis, San Francisco
Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.

NATIONAL

TYPE M&S B TRUCKS

goes the Air Brake . . . and a smooth, positive, tremendously powerful stopping force has spoken ★ A constant assurance of an instantly available power-to-stop, this *voice of safety* identifies Bendix-Westinghouse Automotive Air Brakes as the ultimate in modern, flexible control ★ Aside from their many obvious advantages, Bendix-Westinghouse Brakes are traditionally dependable ★ World-wide, their acceptance as standard equipment by practically every prominent builder of modern, heavy duty highway transportation is conclusive evidence of their consistently perfect operation ★ Fortunately, due to their extreme simplicity, Bendix-Westinghouse Air Brakes are not limited entirely to factory installation ★ Through a nation-wide network of authorized distributors, any vehicle may be readily adapted to air brake control ★ The result of more than a half century's development and manufacture, this modern power braking equipment is available to you . . . a time-tested product of the two greatest names in braking ★ Perhaps you have a question concerning a particular phase of modern power braking, or maybe general information on the subject would be of interest ★ Without obligation, your request will bring an immediate response ★ Address: BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Pennsylvania.

6294

SAFETY STANDARD ★★★ of ★★★ THE WORLD

BENDIX ★ WESTINGHOUSE

AUTOMOTIVE ★ AIR ★ BRAKES

The Largest

Company-Owned Truck Service Organization

in the World

MANY factors have contributed to the phenomenal rise of International Trucks but none has contributed more than the after-sale service. Service is a paramount issue today! What could be more important than adequate service facilities for hard-working, roughly-treated trucks that must carry on, economically, for many years? Fleet owners, confronted with new problems of cost-reduction, are asking themselves that question, and answering it by buying Internationals. They are investing in International Trucks and *putting the entire servicing burden on the shoulders of International Harvester.*

Some years ago International Harvester conceived an ideal of truck service the full import of which was far ahead of the industry—and then proceeded to build that ideal into a nation-wide network of branches equipped to handle every possible service need and emergency. *Today the largest, strongest, most effective Company-owned truck service organization in existence is at the call of International owners.*

INTERNATIONAL

Put *your* servicing problem and responsibility squarely and completely up to International Harvester. You cannot afford to maintain burdensome repair stocks, trained personnel, and costly modern equipment for repairs and overhauling. We cannot afford *not* to provide the very best of service everywhere. *Your job is hauling. Our job is to provide quality trucks—and to keep them on the job.*

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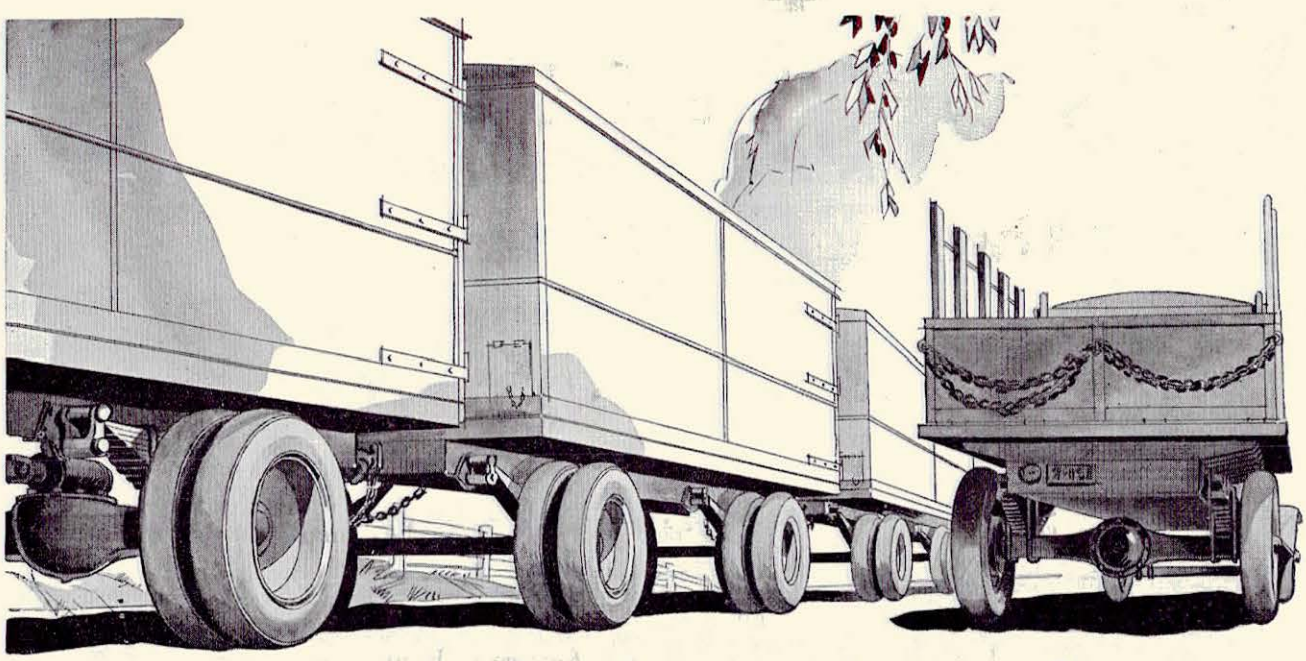
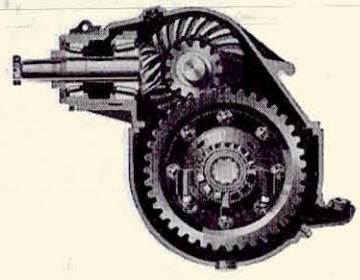


Making the Wheels go 'Round



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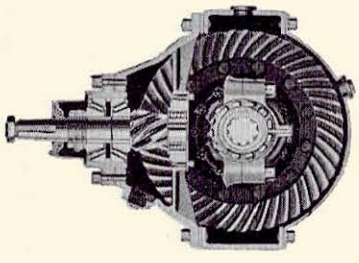

As motor freighting grows, more and more will be known about costs—to fractions of pennies; necessary.

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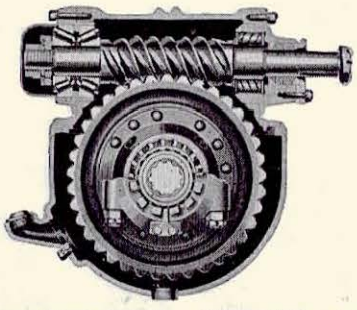

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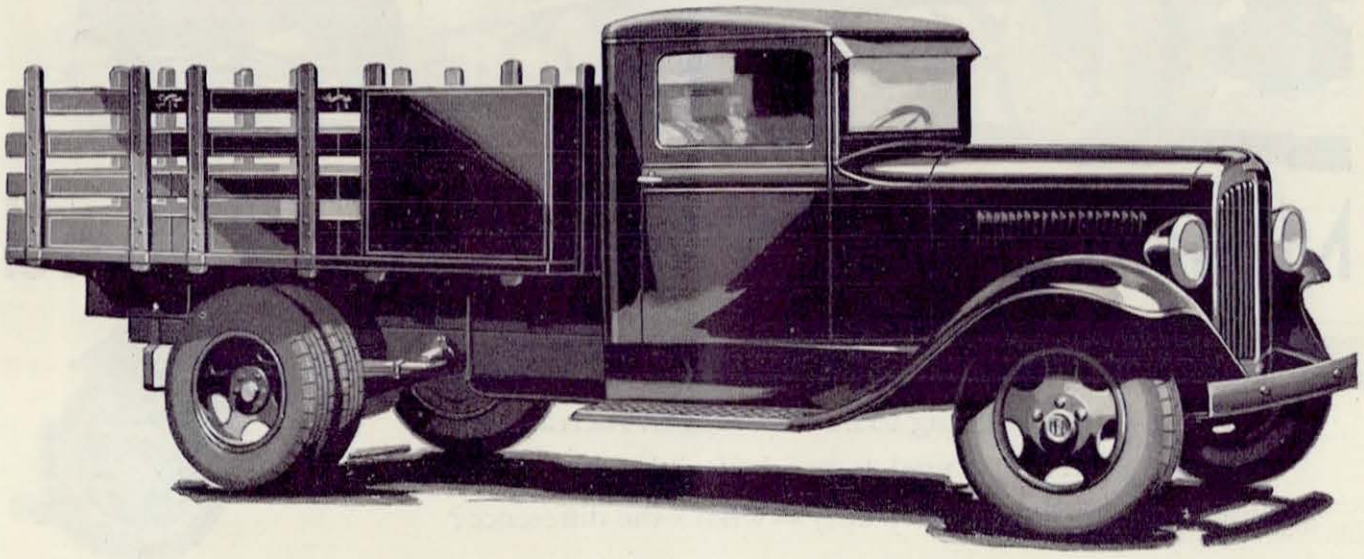

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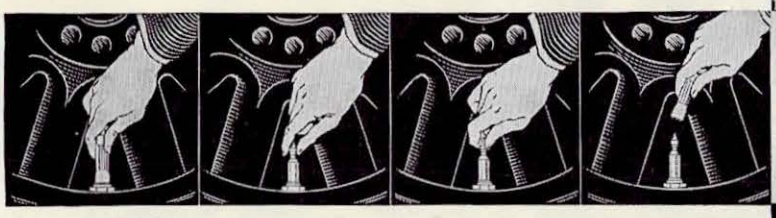

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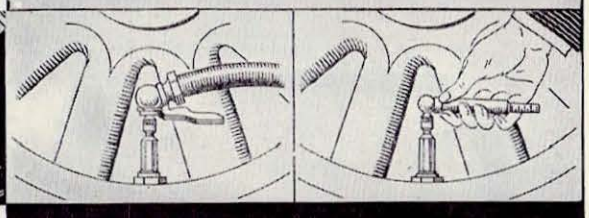

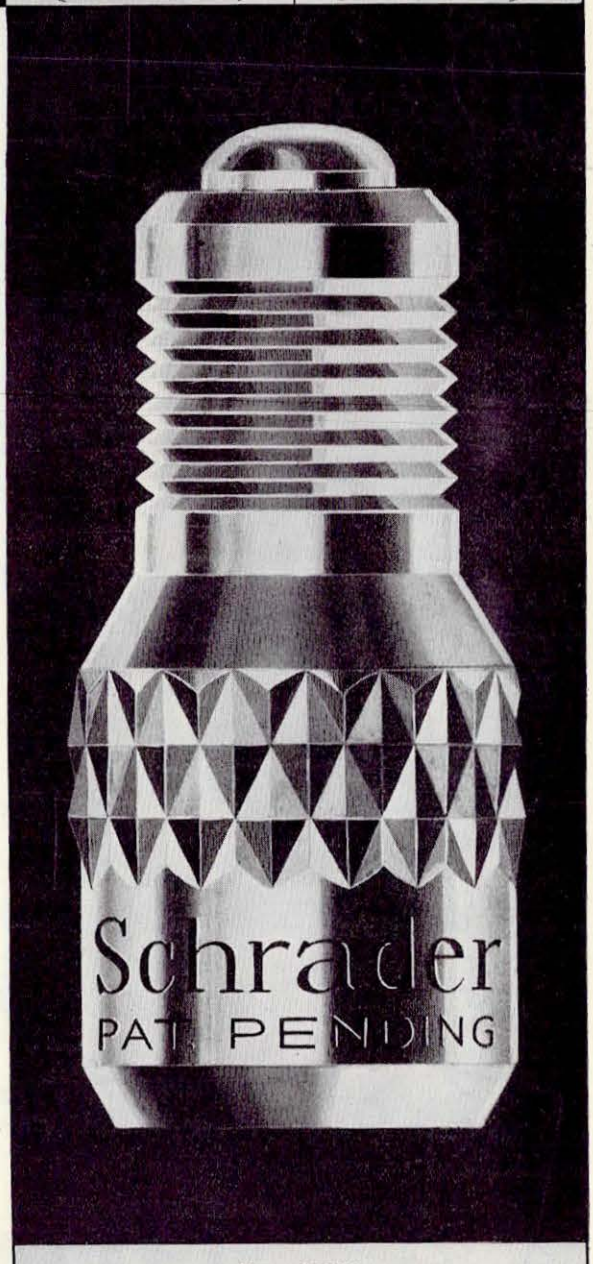

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ALMOST invaribly the description of some emergency short stop winds up with *"it's lucky for us the brakes were good."*

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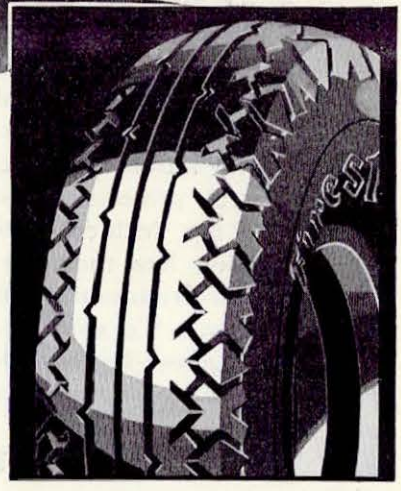

See the Firestone Service Dealer near you today. Let him show you how Firestone Bus Balloons and Firestone Service will save you money and serve you better.

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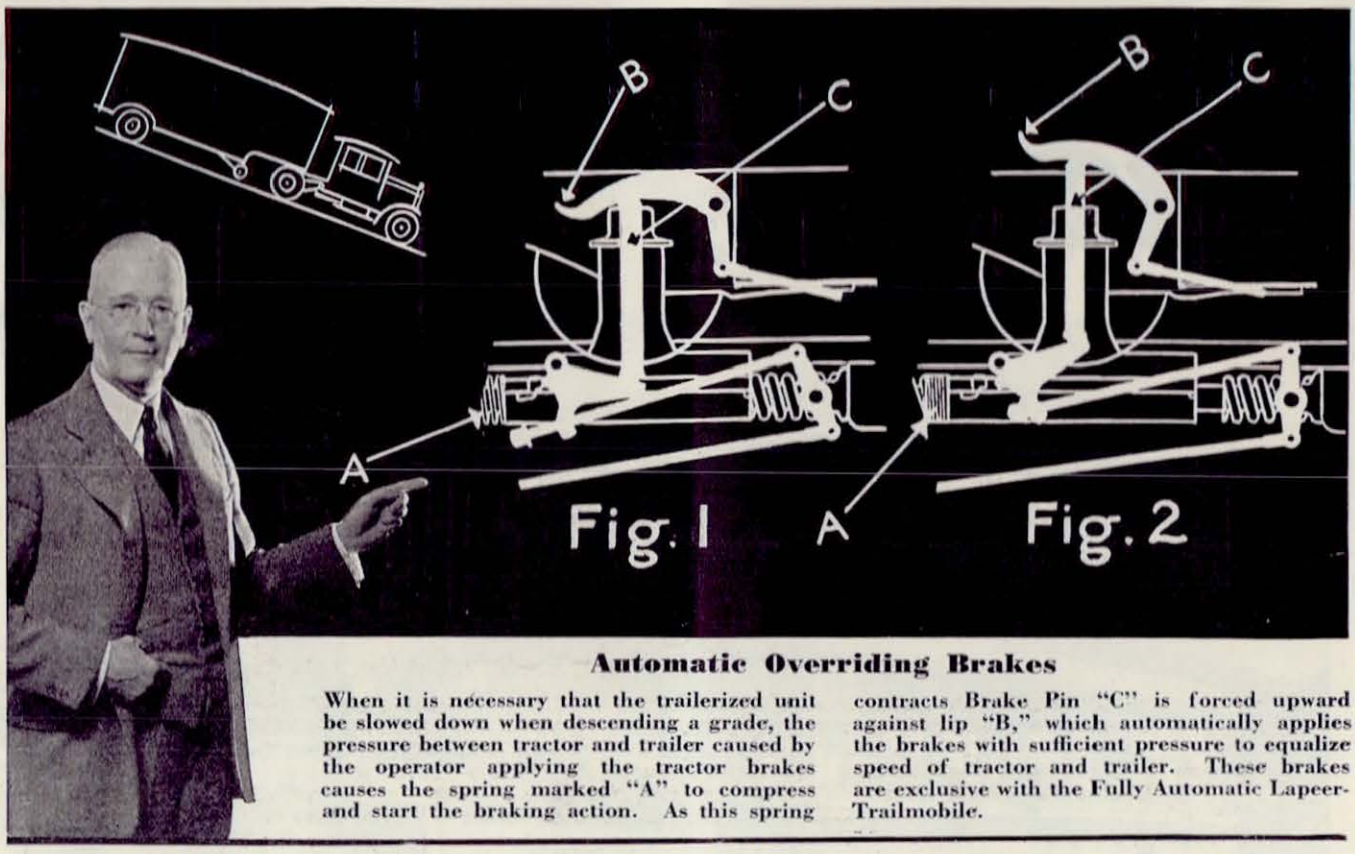

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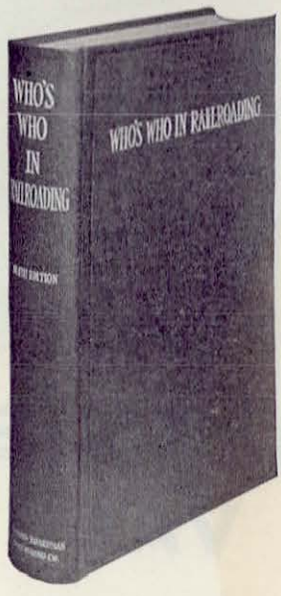
United States-Canada-Mexico-Cuba



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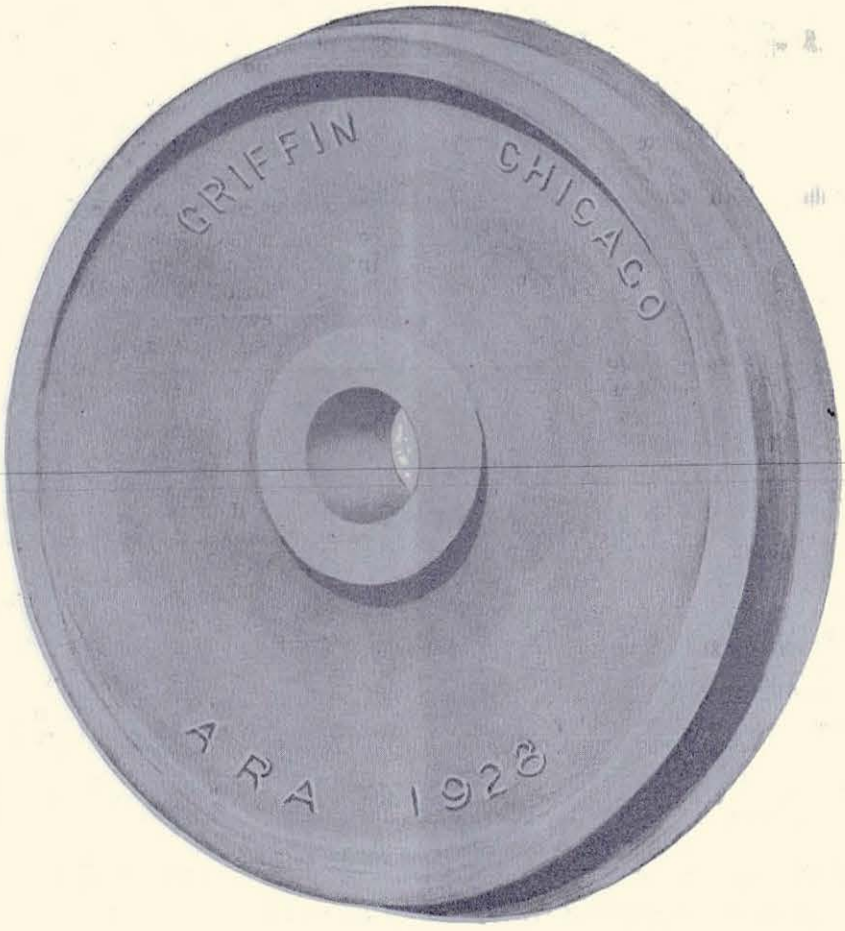

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RAILWAY AGE

Why the Present Railway Situation Exists

The decision of the Interstate Commerce Commission upon the application of the railways for a 15 per cent advance in freight rates will complete an eleven years' test of the soundness of the government's policy in dealing with the railways since they were returned to private operation. They were returned on March 1, 1920, in accordance with the Transportation act, and that act contained certain provisions which were adopted because Congress and the public then recognized the facts, that government regulation had been a failure before the war, that government operation had proven a failure, that private management must be given a better opportunity to succeed in future, and that it could not be given this opportunity without the adoption of a policy of regulation different from that which previously had prevailed.

Within a few months after a general advance in rates was granted to the railways in 1920 to restore their earning capacity a sharp decline in general business occurred, which was followed by general reductions of both railway wages and railway freight rates. A revival of general business began early in 1922, and, although there were fluctuations, general business remained good for about seven years. This long period of good business has been followed by a depression which has now lasted almost two years. Therefore, since the railways were returned to private operation they have been regulated under both favorable and unfavorable business conditions. A government policy, like the management of a business concern or an industry, cannot be tested merely by the results produced under favorable conditions. It must be tested by its results under both favorable and unfavorable conditions. A policy that is apparently successful under favorable conditions, but is a failure under unfavorable conditions, probably has been unsound all the time.

After the Transportation act has been on the statute books for more than eleven years the railways are earning an annual return at the rate of only about two per cent on their property investment, the lowest return in their history since complete statistics have been kept—a return insufficient to pay their fixed charges as a whole; and this is the reason why they are asking for an advance in rates in the midst of a depression. Why are the railroads in such a financial condition eleven years after their return to private operation under a law designed to cause management and regulation which would make private management permanently successful? Is the present situation due to management, or regulation, or both, and if to both, to which is it principally due?

The Record of Management

The way in which the railways have been managed since they were returned to private operation can best be measured by their financing, the economy of their operation, and the kind of service they have rendered. From the end of 1920 to the end of 1929 the increase in the investment in their property was almost four billion dollars greater than the increase in their net capitalization because of the large amounts of earnings that were invested without being capitalized. Such conservatism in financing is unprecedented in the history of the railways themselves, and probably was unparalleled in any other industry during the last decade. In the hearings in the pending rate advance case attention has been called to the fact that average railway net income and dividend per share of stock pretty steadily increased during this period. This, however, was not due mainly to the return earned upon investment, but to the fact that as a result of extreme conservatism in increasing capitalization there was a constant increase in the number of dollars of investment being used to earn net income upon each share of stock. Between 1920 and 1929 annual operating expenses were reduced $1,375,000,000. Meantime, service was made adequate and improved in every respect. Whatever may have been the shortcomings of management, the record demonstrates that on the whole it was honest and efficient, and tried earnestly and ably to promote the interest of the public as well as of investors in railway securities.

Let us now turn to the record of government treatment of the railroads. For a third of a century it has been an accepted constitutional principle, established and repeatedly reaffirmed by the Supreme court of the United States in many decisions, that any industry which is subject to government regulation is entitled to have its rates so fixed that, under good management, it will be able to earn a fair return upon the value of its property. It has been accepted as a sound economic principle, and given the endorsement of a statutory mandate by the Transportation act, that, to enable them to provide adequate, economical and otherwise satisfactory service, the rates of each large group of railways should be so adjusted as to enable the group to earn a fair annual return upon the aggregate value of its property. It was generally conceded when the Transportation act was passed that the returns that the railways had been allowed to earn before the war were too low, and assumed that they would be allowed to earn relatively larger returns in future. It has been generally accepted as a sound principle of public policy that the government should not use its power of taxation or regulation to promote competition with the private capital invested in an industry, or engage in such competition itself.

Violations of Sound Principles

How have these principles of constitutional law, of economics, and of public policy been carried out? In the eleven years ending with 1917, at the end of which government operation was adopted, the return earned by the railways upon their property investment averaged about 4.95 per cent. This period included three years of depression—1908, 1914 and 1915. In the nine years ending with 1929 they earned an average of only about 4.45 per cent, and in the eleven years ending with 1931, which will include three years of depression, they will earn an average of only about 4.14 per cent. Since they were returned to private operation under the Transportation act with the assurance that they would be given opportunity to earn a fair return which would have been a substantially larger return than they earned before the war, they actually have earned a substantially smaller return than before the war, and one not only much less than would be fair under the decision of the Supreme court in the O'Fallon case, but much less than would be fair measured by the standard favored by the Interstate Commerce Commission itself. They have not been rewarded for good management. They have actually been penalized for conservative financing, because the increase in net income per share of stock that has resulted from their conservative financing has been used as an effective argument against allowing them to earn a reasonable return upon their investment.

During most of the period since 1920 the failure of the railways to earn a fair return has been due to the rate-making policy of the Interstate Commerce Commission, because during those years the traffic handled by them could easily have borne rates high enough to have yielded such a return. During more recent years their failure to earn a fair return has been due partly to the use of the governmental powers of taxation and regulation to divert traffic from them to other carriers. They have been called upon to pass through the present depression with such inadequate traffic and a general level of rates that is too low because the constitutional principle that they are entitled to a fair return, the economic principle that they should be allowed to earn such a return, and the principle of public policy that the government should not unfairly promote competition with capital invested in a private industry, have all been violated.

A Policy That Needs Radical Change

The effects of the failure of government to deal with the railways in accordance with sound principles of law, economics and public policy were obscured by the long period of general prosperity, but have become very plain during the present depression. After the decision of the Commission in the pending proceeding for an advance in rates has been rendered, we will know what the government is willing and able to do, in a period of depression, to remedy the effects of an unfair, unsound and dangerous policy adopted and followed during years of prosperity. One thing is certain, however, and this is that a policy which will not cause disaster to an industry merely in years of prosperity, and must be radically changed to save it from disaster in a period of depression, is a policy that needs to be permanently changed. As a matter of fact, the present financial condition of the railroads affords a complete demonstration that the government's policy in dealing with them ever since 1920 has been unsound and a failure. If the policy of the Transportation act had been carried out ever since it was passed, the present railway situation would not exist.

Developments in both prosperity and depression have shown that the policy of the Transportation act was sound and in the public interest, and the public must face the fact that if it is to avoid government ownership or railroad bankruptcies and serious deterioration of transportation service, the policy of the Transportation act must be carried out in future, and not ignored as it has been throughout the last decade.

"Billions for Bunk"

This is the arresting title of a recent double-page newspaper advertisement of R. H. Macy & Co., the well-known New York department store. Under this heading the advertisement reads:

> Plundering the public treasury for billions will never bring the country out of this depression. A fine new post-office at Podunk Center, a deeper channel in Cherry Creek, new roads which are not needed—none of these things will restore prosperity. They would add a crushing tax burden which everyone, directly or indirectly, would have to pay. This country should beware of organized bands of treasury raiders. What we need is better circulation of private funds. Millions of people have

more money in the bank than they need. They could buy new clothes, new radios, new automobiles, new homes, but the great American pocketbook, has been glued shut from sheer fright.

It is not always that one may look to retail advertising for instruction in fundamental economic principles. Macy's advertisement, however, conveys a message so true, so important, yet so imperfectly realized, that one might wish to see it displayed again and again until its wisdom permeates the public understanding.

Why are the dollars which, by retail purchases or by investment in industry, could bring back prosperity so reluctant to get busy and do so? Plainly, as Macy's says, because they are scared. Why are they scared? Specifically, why are dollars which might be invested in railroads scared? They are scared because their fellows which have gone before them have been so badly treated: Dollars for which a wage of 5¾ per cent was promised are now earning about 2 per cent—many of them not even that. They are earning so little largely because of the very process of taxation referred to in the advertisement—taxation which is not only unbearably burdensome of itself, but which is used to finance heavy-duty highways which are not needed and to dig a "deeper channel in Cherry Creek" —activities which result in diversion of traffic from the self-supporting railways to their tax-supported rivals.

If this is the manner in which hard earned dollars honestly invested in a legitimate private enterprise are to be treated by the public through its elected representatives, is it any wonder that other dollars reposing rather more safely on deposit are content to remain there?

The railroads, of course, are not the only industry, and others are also depressed. Yet there is no one industry which is so widely owned—directly and indirectly—as are the railroads. Jeopardize the greatest outstanding example of private industry, representing over 6 per cent of the total national wealth, and what confidence can be built up in the remainder? The railways and other taxpayers are being heavily burdened to introduce a semi-socialized system of transport in competition with the privately-owned, self-supporting railways—the largest and most important example of corporate enterprise. That fact alone is sufficient in itself to perpetuate doubt about our industrial and economic future as a society founded on private initiative and endeavor.

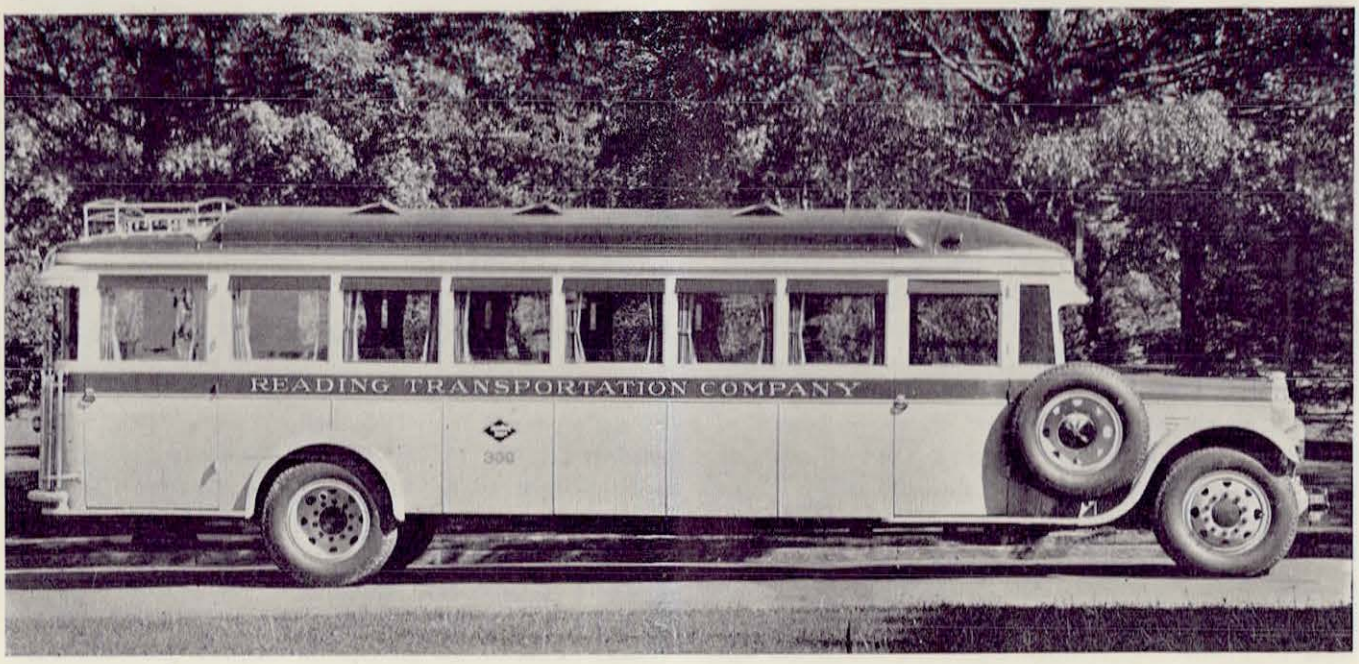
We do not disregard other causes of the present depression—the international debt situation, the growing tariff barriers between nations, the grievously low prices of agricultural and other basic commodities. But solve all of them, and doubts still must linger. One cannot imagine a Communist state deliberately setting out by legislation to destroy an outstanding Communist institution. If it did so, then one might predict serious troubles for Communism. Similarly, when the leading capitalist nation of the world takes steps —either positive or those of inaction—to jeopardize its principal private enterprise, is it any wonder that knowing investors and wise spenders lean to extreme conservation in their commitments? If socialistic competition is to succeed in crippling the railroads today, may it not tomorrow attain similar victories in banking, in milling, in the manufacture of farm implements, or in any other industry now fondly believed to be immune in the hands of individual or corporate owners?

Lost Traffic Can Be Recovered

To show steady increases in business during a time of depression is a notable achievement. This is the record of the Pacific Motor Transport Company, freight-carrying subsidiary of the Pacific Electric, which operates over the lines of that company and the Southern Pacific. Month by month since March, 1929, with but few exceptions, the Pacific Motor Transport Company has enjoyed a steadily increasing traffic. Part of the increase in business has been due to extensions of the company's operations; but there have been few such extensions since December, 1930, yet, the traffic handled has shown its largest increases since that time. In December, 1930, the Company handled approximately 3,400 tons of freight, with revenues slightly in excess of $26,000. In January, 1931, the tonnage handled increased to approximately 5,500 tons, while the revenue increased to approximately $41,000. In June, 1931, the tonnage handled closely approached the 10,000-ton mark, while the revenues exceeded $80,000.

The Pacific Motor Transport Company's plan of operation is familiar to many railway officers. Briefly, its purpose is to utilize existing railroad and motor trucking facilities to provide a fast, co-ordinated transportation service for l.c.l. freight. The plan has been adopted, with a few modifications in some cases, by several other Western roads, and has proved uniformly successful.

The Pacific Motor Transport Company was organized for the purpose of recovering for the railways traffic which they had lost to competitive motor trucks. This purpose the company is already accomplishing to the extent of more than 10,000 tons of freight a month. In an article in the Motor Transport Section of this issue, L. B. Young, vice-president and manager of the Pacific Motor Transport Company, describes how this has been done. In a word, the Transport Company has been successful in recovering traffic because it has provided the same or better service than its competitors. What is even more important, it has recovered traffic on an operating basis which permits a profit to be earned on the business handled. Mr. Young's article, as well as the methods and achievements of his company, are commended to the attention of railway officers who are searching for a means of meeting motor truck competition.



Substituted for Passenger Trains, the Motor Coach Can Save the Railways Millions of Dollars Annually

Cut Costs With Motor Coaches

Large savings can be made by substitution of motor coach service for train service—Operating costs of buses 20 to 25 per cent of trains

MILLIONS of dollars can be saved annually by the railways through the substitution of economical and adequate motor coach service for expensive and unprofitable local passenger train service. Practically every railway is now operating passenger trains from which the revenues are far below the out-of-pocket cost of operation. Where highway conditions are suitable and where the volume of head-end traffic is not too great, motor coaches can accommodate all the traffic handled by such trains with savings in operating costs of from 60 to 80 per cent. The dozen leading railways which are operating motor coaches on an extensive scale are each saving from $100,000 to $1,000,000 a year by the replacement of passenger trains. What these roads have done, others can do.

Under the existing system of regulation, it is often impossible for a railway to discontinue passenger trains when their operation becomes unprofitable, even if the railway itself were inclined to leave its patrons without passenger transportation service. Unable to secure an adequate volume of traffic in the face of highway competition, and unable to discontinue passenger service entirely, the problem faced by the railroads is that of providing adequate passenger service at the lowest possible cost.

In these days, most lines of railway are paralleled by improved highways, so that it is generally feasible to operate a motor coach in substitution for a train, making the same station stops and adhering to a comparable schedule. Few state regulatory commissions are inclined to turn a deaf ear to the request of a railway for permission to discontinue passenger trains when motor coach service is to be offered in substitution. The railways have the organization and facilities to operate motor coaches. And the cost of motor coach operation, compared to the cost of passenger train operation, usually is as one is to four or five.

It is true that the cost of motor coach operation is low largely because of the fact that motor coaches utilize state-provided highways for their roadbed, enjoy relative freedom from regulation and pay relatively low taxes in return for this privilege. In their present emergency, however, there is no logical reason why railways should not take advantage of this situation, which their competitors are capitalizing on, without prejudice to their conviction that motor coaches should be taxed more heavily and subjected to regulation comparable with that of the railways. Furthermore, the other economies of motor coach operation are sufficient so that the motor coach, even if adequately taxed, would still be a money-saving substitute for many trains.

The cost of operation of a local passenger train varies on different roads and in different localities, but on the average it is somewhere between 80 cents and $1.25 a mile. This is the out-of-pocket cost of oper-

ation, the amount which can be saved if the passenger train is taken out of service. On the other hand, the total cost of operation of a motor coach, while also variable, ranges from 16 to 30 cents a mile, depending to a large extent upon the locality and method of operation, with the average approximately 23 cents a mile. The margin between the cost of operation of a motor coach and the out-of-pocket cost of operation of a passenger train, then, is on the average somewhere between 55 cents and $1.00 a mile. This is the net saving which can ordinarily be accomplished through the substitution of a motor coach for a train.

Substantial Savings on Individual Lines

The savings which can be effected through the substitution of motor coach service for train service are large, even in the case of single lines. That this is true is readily indicated by the fact that a saving of 55 cents to $1.00 a mile on an operation of 200 miles a day for 300 days in a year amounts in the aggregate to from $33,000 to $60,000. To cite a specific example, the Illinois Central, in the substitution of a motor coach for two passenger trains operating between Waterloo, Iowa, and Dubuque, is accomplishing an annual net saving—the difference between the cost of operation of the train and the cost of operation of the motor coach—of $33,239.50. On another single line operated by the Illinois Central, the net saving is approximately $26,000 a year.

If a train replacement program can be carried out more completely over an entire railroad, or over a major part of it, the savings are even more substantial. The Boston & Maine, a pioneer in motor coach operation, has been able, as the result of its program of replacement of trains with motor coaches, to save $195,000 a year in train operating expenses. The New York, New Haven & Hartford, through its substitution of motor coaches for passenger trains, has eliminated 836,366 passenger train miles a year, at an annual saving of $1,201,523. The Reading has replaced a number of passenger trains with motor coaches and is now saving 391,000 passenger train miles annually, reducing its operating expenses by $409,000. The St. Louis Southwestern is saving $543,896 annually in the substitution of motor coaches for trains. The elimination of certain passenger train service in favor of motor coach operation on the eastern lines of the Burlington is saving that company $117,156 a year. Since the inauguration of its motor coach service, the Union Pacific has been able to eliminate 2,276,956 train miles per year at a very real saving in operating expenses. The substitution of motor coach service for train service on the Pennsylvania has enabled that railway to eliminate 798,561 train miles annually, at an annual net saving—the difference in cost of the two services—of $478,240.

Complete Replacement Possible

Other examples of savings accomplished by railways through the substitution of motor coaches for passenger trains might be cited, but these will probably suffice to prove the point. Motor coaches are available which will handle not only 15 or more passengers, but a substantial volume of mail, baggage, and express traffic as well. Because of this, the complete substitution of motor coach for passenger train service can be effected in many instances. On the Central of Georgia, motor coaches have completely replaced passenger trains on several branch lines, with net savings of from $4,000 to $10,000 on each line.

The realization that such savings can be accomplished is responsible for the present rapid increase in motor coach operation on the part of the railways. Eight times as many railways are now operating motor coaches as were operating them in 1925, and more than 13 times as many motor coaches are operated, while the mileage of highway routes operated by railways has increased 25 times. Specifically, the number of railways operating motor coaches has increased from 10 to 81, the number of motor coaches operated has increased from 300 to 4,000, and the number of miles of highway routes has increased from 2,000 to 50,000. In spite of this, there still remain literally hundreds of places where economy would result from the substitution of motor coaches for trains. This must be true when one railway is saving large sums annually because it has a majority of its rail lines paralleled by its highway routes, while another railway in the same territory has only one or two motor coach runs of its own, or perhaps none at all. In contrast to the dozen roads which have effected motor coach substitutions for trains on an extensive scale are the scores which have either established only one or two highway lines or have not even experimented with motor coach operation.

Several different methods of motor coach operation can be employed by the railways. To date, the majority have organized subsidiary companies which set up their own operating and maintenance organizations, but which utilize the facilities of the railways in the sale of tickets and solicitation of traffic, the keeping of accounts, and the handling of legal matters. This use of railway facilities by the motor coach subsidiaries naturally results in a reduction of the expenses involved in motor coach operation. Typical of such roads are the Boston & Maine, the New York, New Haven & Hartford, the Reading, the Baltimore & Ohio, the Missouri Pacific, the St. Louis Southwestern, the Chicago & North Western, and the Union Pacific.

Other roads have acquired an interest in large independent motor coach systems through the purchase of their stock, utilizing the facilities of these motor coach companies in the replacement of train service, much as if these companies were railway subsidiaries. This method of operation is employed by the Pennsylvania, the Great Northern, and the Southern Pacific. Still other roads either operate motor coaches directly, their railway departments and railway employees having charge of the operation, or contract with independent bus-operating companies for the provision of bus service in replacement of train service, railroad tickets being honored on the buses. The Chicago, Milwaukee, St. Paul & Pacific and the Chicago & North Western are among the roads which have adopted this type of operation.

The extent to which it is possible for the railroads to engage in motor coach operation is indicated by a comparison of the railway mileage with the highway mileage of those roads which have gone the farthest in the motorization of their service. The Boston & Maine, with 2,090 miles of railway lines, has 936 miles of motor coach routes. The Missouri Pacific, with 7,451 miles of railway lines, operates 3839 miles of motor coach routes. The New York, New Haven & Hartford, with 2,122 miles of railway lines, reported to the Interstate Commerce Commission last year that it was operating 2,126 miles of interstate routes and 1,105 miles of intrastate routes. The Reading has 1,575 miles of railway lines and 779 miles of motor coach routes. The St. Louis Southwestern, which has 1,913 miles of railway lines, has carried out a system-wide program of replacement of local passenger train service with motor coaches. This company reported to the Interstate Commerce Commission last year that

it was operating 1,195 miles of interstate motor coach routes, and 995 miles of intrastate routes.

Difficulties Can Be Overcome

Carrying out the substitution of motor coach service for train service may sometimes be a slow and difficult process. A proposal to discontinue train service is usually objected to by the people living adjacent to the affected line, regardless of whether or not they are currently making any use of the passenger train service. Another difficulty may be encountered when the highway over which a railway proposes to operate motor coaches is already served by an independent operator, holding a certificate from the regulatory commission. Here a railroad can adopt the expedient of buying out the holder of the certificate; in fact, this is the most general practice. Other railroads, however, have been able to secure decisions from regulatory commissions holding that, where a railway proposes a motor coach service which will be a mere substitute for train service, making only railway station stops, it should be permitted to do so regardless of the presence on the same highway of an ordinary motor coach operator.

Public objection to the removal of train service has prevented the substitution of motor coach service in a number of instances. A road can, however, offer more frequent service by motor coach than is provided by train. It can do this without endangering the economy feature of the motor coach substitution because of the low cost of motor coach operation. This provision of more frequent service, in nearly every instance where it has been offered, has succeeded in winning public approval.

It is not to be expected that the substitution of motor coaches for passenger trains will be entirely effective in stopping the loss of passengers, for this has not been the experience of most railways. Ordinarily the decline in passenger traffic continues, so that the principal benefit of the motor coach operation lies in the reduction of the expense involved in providing passenger service. On the other hand, if more frequent service is provided by motor coach and if there is determined solicitation of traffic, increased patronage of the motor coaches should result. On the Cotton Belt, for example, the passenger revenues in 1930 of the railway and its subsidiary transportation company, exceeded the passenger revenues of the railway in 1929. In some instances, furthermore, a profit can be earned even on the operation of motor coaches which are substituted for passenger trains. Usually the traffic handled by such motor coaches is so light that the only profit earned by the motor coach equipment lies in the saving in train operating expenses which it makes possible. Nevertheless, the Illinois Central last year had a net income of nearly 19 per cent on its investment, in its operation of a train-replacement motor coach, and other roads have enjoyed similar success.

The problem of reducing the losses suffered because of unprofitable passenger train service is one which every railway is facing. The urgent necessity of reducing the expenses involved in providing necessary passenger service is likewise shared by all railroads. The opportunity to provide adequate passenger service at the minimum cost, an opportunity available to the average railway, lies in the substitution of motor coach service for many lightly-patronized, unprofitable passenger trains.

In Next Week's Issue

One of the millstones of railway operation is the heavy cost of operating classification yards, for which service the railroads receive no direct compensation since this classification does not in itself forward the car on its way to its destination. The car retarder system, by reason of its ability to reduce the cost of operating classification yards and at the same time expedite the movement of the traffic, is being accepted as a necessary facility for modern yards. The next article in this series will explain the savings that can be effected in yards equipped with retarders and present suggestions for the application of such equipment to other yards.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended July 11 amounted to 763,581 cars, an increase of 92,702 cars as compared with the week before, which included the holiday, and an increase of 4,291 cars as compared with the week before the holiday. As compared with last year, however, the decrease was 152,404 cars, and as compared with 1929 it was 302,833 cars. Loading of grain and grain products showed an increase of 2,806 cars as compared with the corresponding week of last year and of 654 cars as compared with 1929. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

Week Ended Saturday, July 11, 1931

Districts	1931	1930	1929
Eastern	166,062	201,938	238,614
Allegheny	144,632	187,701	220,375
Pocahontas	45,821	52,930	60,575
Southern	103,167	119,137	138,925
Northwestern	106,177	143,277	169,254
Central Western	127,390	136,873	157,521
Southwestern	70,332	74,129	81,150
Total Western Districts	303,899	354,279	407,925
Total All Roads	763,581	915,985	1,066,414
Commodities			
Grain and Grain Products	60,121	57,315	59,467
Live Stock	18,147	22,479	24,762
Coal	110,127	135,224	153,673
Coke	5,085	8,785	11,767
Forest Products	26,170	39,675	60,596
Ore	36,288	66,575	78,622
Merchandise L.C.L.	215,853	230,297	255,806
Miscellaneous	291,790	355,635	421,721
July 11	763,581	915,985	1,066,414
July 4	667,879	792,053	911,143
June 27	759,290	936,690	1,096,569
June 20	739,116	920,645	1,069,874
June 13	732,453	926,066	1,069,670
Cumulative total 28 weeks	20,411,444	24,908,614	27,594,510

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended July 11 totaled 47,729 cars, an increase over the previous week of 4,184 cars and a decrease of 13,259 cars from the same week last year.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada		
July 11, 1931	47,729	20,803
July 4, 1931	43,545	24,179
June 27, 1931	50,338	23,817
July 12, 1930	60,988	26,745
Cumulative Totals for Canada		
July 11, 1931	1,349,030	764,945
July 12, 1930	1,646,832	975,872
July 13, 1929	1,843,252	1,181,202

The New Bridge Across the Atchafalaya, Texas & Pacific, Melville, La.

Bridging the Atchafalaya Under Difficulties

High water, deep foundations in unstable material and obstructions in bed of river complicate problems of construction

THE Texas & Pacific has recently completed a single-track through truss bridge, 2,336 ft. long, across the Atchafalaya river at Melville, La., the construction of which presented unusual difficulties. The principal problems which were met and solved included the instability of the foundation material, which required foundations of great depth; numerous obstructions which were encountered in the bed of the river; an almost continuous high stage of the river during construction; and the necessity of erecting three 400-ft. fixed spans and one 176-ft. vertical lift span during the highest stage of the river, without recourse to falsework.

The history of the efforts to bridge the Atchafalaya is one of disaster. To understand clearly why this is so and to visualize the adverse conditions which were encountered in the construction of the bridge under consideration, a brief sketch must be given of the character of the stream and the adjacent country and of the history of the river. For many miles on either side, the country is low, flat and, in places, swampy, and is intersected by sluggish streams and bayous. The general elevation ranges from 25 to 30 ft. above mean gulf level, while the soil to a great depth consists principally of water-logged silt and quicksand. Because of these characteristics, it is extremely unstable and erodes easily.

During ordinary stages of the river the current is sluggish, low water elevation being only about 3.5 ft. above gulf level. At higher stages, however, the velocity of the current increases rapidly and in some instances scours the bed of the stream deeply, depths of 125 ft. having been found in places. With the exception of one bridge, this erosion has either directly or indirectly, caused the failure of one or more piers or abutments in the structures spanning this stream.

Early settlers along the Atchafalaya found a shallow stream, the bed of which was filled with "rafts," consisting of natural dams and mattresses composed of interlaced logs and other drift which protected the channel from scour and erosion, so that from the earliest times the bed and banks were stable. These rafts not only made navigation impossible, but restricted the carrying capacity of the channel during high water, and they were removed, beginning in 1839. The removal of these rafts greatly increased the velocity of the current during high water, and led to a rapid enlargement of the channel with respect to both width and depth.

The situation at the source of the Atchafalaya is unique. Normally the waters of the Red river enter the Atchafalaya through an ancient cut-off arm of the Mississippi, known as Old river. The Atchafalaya, being leveed from its beginning at its junction with Old river below the mouth of the Red river, is a stream which, during normal flow, receives all of the Red river waters and some from the Mississippi river, but no surface drainage from adjacent lands behind the levees. Owing to the situation at its source, it acts as an outlet for part of the waters of the Red river when that stream is at flood. Should the stage of the Mississippi be higher than that of the Red, however, the flow in Old river is reversed and all of the waters from the Red river are forced into the Atchafalaya, in addition to a considerable flow from the Mississippi.

First Bridge Built in 1883

The Texas & Pacific constructed its original bridge across the Atchafalaya in 1883. This structure had a length of 960 ft. and was supported on masonry piers that reached to a depth of 85 ft. below mean gulf level. At this time high water elevation was at +37.3 ft. and the elevation of the base of rail was placed at +44.8. The channel area was 33,000 sq. ft. and the maximum flood discharge was 130,000 cu. ft. per sec. By 1896,

however, only 13 years later, continued erosion had increased the width and depth of the channel to such an extent that it had an area of 70,000 sq. ft., while the maximum discharge was 420,000 cu. ft. per sec.

This bridge was replaced in 1896 with a structure 1520 ft. long. The four main piers were utilized for the support of the new spans and two piers sunk to elevation —97.3 were added. The new abutments were supported on pile foundations. This bridge consisted of one 300-ft. swing span and four 250-ft. and one 217-ft. fixed spans. The base of rail of this structure was raised to elevation +44.8.

Subsequent to 1896, erosion was much less rapid, the enlargement in the vicinity of the bridge being confined to occasional caving of the east bank. High water elevations increased progressively, however, the floods of 1916 and 1922 having stages of 43.5 ft. and 45.9 ft. respectively, while the flood of 1927 reached a stage of 47 ft. and resulted in a sharp increase in the flood channel area between levees to 110,000 sq. ft., and a maximum discharge of 660,000 cu. ft. a sec.

Pier Washes Out

During this flood, the rest pier at the west end of the draw span, one of the original piers constructed in 1883, was washed out, dropping the adjacent fixed span into the river. Subsequent examination of the remaining piers indicated considerable deepening of the river bed, while the increased width of the channel demanded the erection of additional spans. These considerations led to the decision to replace the existing structure with a single-track bridge, 2,336 ft. long, which extends the full distance between the levees on each side of the river. Owing to the continued rise of the flood plane, the new bridge was raised to bring low steel to elevation +50 and the base of rail to +55.1, approximately four feet above the elevation of the crest of the levees.

Since the remaining piers were of insufficient width for the new bridge and not deep enough to insure against further foundation failure as a result of scour, five new piers were sunk to elevation —135, which gives a depth of 182 ft. below high water. At the same time the length of the three main spans was increased to 400 ft. and the swing span was replaced with a vertical lift span 176 ft. long, having a total vertical movement of 50 ft. In addition, there are three 250-ft. through truss spans and three deck-girder spans, each of which is 59 ft. 6 in. long. The abutments and the remaining four piers are supported on pile foundations.

Immediately upon the approval of the foundation plans, on November 2, 1927, preparatory work was started, and the caisson for Pier E, the westerly pier, was launched from the west bank on March 10, 1928. The caissons for the remainder of the main piers were landed as follows: Pier A, April 10, 1928; Pier D, September 1, 1928; Pier C, October 15, 1928; and Pier B, November 15, 1928. The abutments and smaller piers were constructed at intervals as the conditions on the work permitted. Erection was completed and the bridge was opened to traffic on September 1, 1929, although the removal of the original piers was not completed until late in the winter of 1929-30.

Main Piers Are Duplicates

All of the main piers were constructed in accordance with a common plan, which is shown in the accompanying drawing, and all were sunk to approximately the same depth, the extreme range in this respect being Pier D, —134.7 and Piers A and E, —135.7. The caisson for Pier A was constructed in place, since the elevation of the ground at the site of this pier was above water. The caissons for the remaining piers were constructed in octagonal pontoons and floated to place. The greatest depth of water encountered during the placing of the caissons was at Pier D, which was landed at —30 with the stage of the river at +17.5.

Erecting a 400-ft. Span, With the River at Its Highest Stage

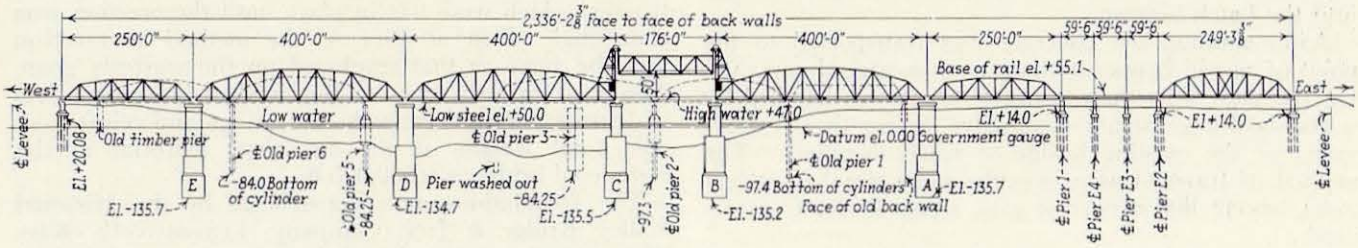
Fortunately, a low velocity of current prevailed during the landing of all of the piers, but as a precaution against possible adverse conditions, three clusters of anchor piles were driven 100 ft. from each pier, one upstream in line with the pier and the other two at the sides. These anchors were reinforced with three mushroom clusters about 300 ft. upstream, and the two groups were held together securely by means of several lines of cables. An additional cluster of anchor piles was driven 50 ft. downstream. Lines from each cluster of anchor piles were attached to the top and bottom of the caisson and were retained until sufficient penetration had been secured to insure stability and reduce the possibility of scour to a minimum.

Logs and Other Obstruction Complicate Work

Immediately upon the landing of the caissons, air was applied and the piers were sunk by the pneumatic process to a depth of about 90 ft., below the water surface, after which the open dredging process was employed. It had been hoped that the entire operation could be carried out by open dredging, but the preliminary foundation investigations had disclosed such a multitude of submerged logs, reaching far below the river bed, that this method was not possible.

At slightly varying depths, however, a stratum of

sand was encountered below which the logs, while not greatly diminished in number, were almost without exception badly decayed, so that they offered no serious obstruction, being easily removed by means of the clamshell buckets. Other obstructions which were met above this sand stratum and which added to the difficulties of excavation, were a bank protection mattress, 8 ft. thick, composed of heavy stone, willows and logs, which was encountered at Pier D; and the iron shell of the washed-out pier, which was struck by the cutting edge of the caisson of Pier B.

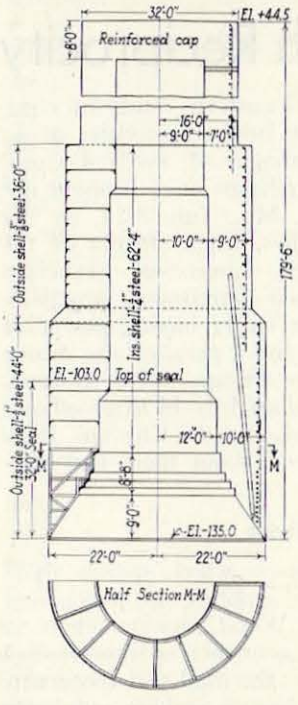


Elevation Showing Arrangement of Spans and Piers of Old and New Bridges

Air was applied to only one pier at a time, the work being prosecuted continuously until it was released. At the beginning, the caisson crews worked full four-hour shifts. As the depth increased, this period decreased progressively, until at the greatest depth, when the maximum air pressure was 47.5 lb., they worked only one hour, rested two hours and worked one hour on a shift.

Open Dredging Employed After Release of Air

After the air was released, the remainder of the excavation was removed by open dredging, by means of a floating derrick equipped with a clamshell. To facilitate the action of the cutting edge during this part of the work, a 6-in. pipe had been embedded in the concrete shell and connected to manifolds in each quadrant, which had jets on 4-ft. centers. Piers B and C gave no trouble with respect to direction or horizontal displacement at any stage of their construction, and only minor trouble, which was easily corrected, was experienced with Pier D. On the other hand, Pier E leaned definitely to the north at one stage, but by a combination of pulling and jetting it was restored to position, although it eventually leaned slightly to the south. Pier A gave considerable trouble, however, and was controlled with great difficulty.



Section of Pier and Caisson

Preparatory to releasing the air and removing the locks from each of the caissons, the timbers forming the roof of the working chamber were loosened and the bolts holding the 48-in. girders were released, so that these members could be removed to avoid interference with the dredging. Upon the release of the air they were dropped into the pit and raised to the surface by means of cables which had been attached for this purpose. This was accomplished without difficulty, except at Pier A, but when the air was released on this pier there was an unexpected settlement and the chamber filled so quickly with mud and sand that the girders were given no opportunity to drop.

After protracted but unsuccessful efforts to remove the girders, including blasting with dynamite, the services of a deep-sea diver equipped with a complete underwater cutting outfit were secured. Owing to the lack of visibility, the depth at which the work was done and the conditions encountered by the diver, it required 12 days to clear the caisson.

Pier Settles Out of Position

Simultaneously with the drop which took place upon the release of the air, the pier settled out of plumb to such an extent that the bottom was one foot too far east, while the top was four feet out of position to the west. With the release of the girders, immediate steps were taken to bring the pier back into place, which was accomplished by a combination of pulling and jetting. Careful calculations were made to determine the pulling load that could be applied safely and this was found to be in excess of 400 tons.

Accordingly, a dead-man grillage was installed and 10 lines of 1¼-in. cable were attached to I-bar chains which led to the grillage. A load of 400 tons was applied at a point 50 ft. above the bottom of the normal pier section, and extensometers were used to measure the magnitude of the pull. As the load was applied, exterior jets were brought into action on the east side of the pier and after considerable effort it was returned practically to true position, after which it was completed without further serious difficulty.

Concrete Mixing Plants

Exactly similar concrete mixing plants were set up on the east and west levees, the westerly plant serving Piers D and E west of the break in the continuity of the old bridge, while Piers A, B and C were served by the easterly plant. The aggregates were stocked separately on the ground and were handled to separate aggregate bins situated above the mixers, by means of a stiff-leg derrick equipped with a clamshell bucket.

Careful measurements were made of the aggregate bins and they were marked for volume, based on a series of test weights of the aggregates. The aggregates were delivered from the bins to a batch hopper which was placed directly above the mixer, the amount delivered being controlled by means of under-cut gates in the delivery spouts which served the separate bins. The cement was emptied from sacks into a skip for each batch and was hoisted and dumped automatically into the batch hopper.

After mixing, the concrete was transported to the point of use in hopper-bottom, narrow-gage dump cars. On the west side, these concrete cars were handled by a standard-gage steam locomotive, using the westerly spans of the existing bridge to reach the piers. The method of transportation was the same for the easterly piers, except that a narrow-gage steam locomotive was used.

Concrete of medium consistency, having a slump of about four inches was used throughout. Test specimens were taken twice at the beginning of each pier and at appropriate intervals during the progress of the work. These specimens broke at loads ranging from 3,500 to 4,000 lb. a sq. in. The careful inspection given to the proportioning and mixing of the concrete and the uniformity of the concrete produced are indicated by the fact that the lowest load required to break a test specimen was 3,000 lb. A total of 33,000 cu. yd. of concrete was required to construct the piers and abutments.

Methods of Erection

Erection of the superstructure presented problems only slightly less difficult than those encountered in the construction of the piers. There were rather wide fluctuations in the stages of the river while the foundation work was under way and although the water did not reach the highest flood stage during this time, it was continuously above normal.

About the time erection was to start, however, the river began to rise, reaching a stage of 43.1 ft., and remained approximately at this stage during a large part of the period of erection. Owing to the velocity of the current, about eight miles an hour, and the resulting probability of scour and heavy driftwood it was not considered safe to rely on falsework in the erection of any of the channel spans. In addition, the great depth of the water would have required excessively long piling.

Accordingly, a plan of erection was developed which eliminated the necessity for falsework piles. The most westerly span, a bank span 250 ft. long, was erected on falsework consisting of mud sills and blocking. The next span, the first channel span, 400 ft. long, was erected from the older trusses which corresponded with this span, the two-panel gap between the new and old piers being easily cared for. The adjacent 400-ft. span which bridged the opening left by the failure of the pier was then erected by cantilevering it from the 400-ft. span previously erected.

This brought the erection past the pivot pier of the swing span and to the new lift span. The west arm of the swing span, which had been unsupported since the failure of the rest pier, had been removed previously, to minimize interference with the erection of the second channel span. The west lifting tower was erected in place and a temporary bent was set up on the easterly rest pier of the swing span. The lower chord of the lift span was then supported on brackets attached to the tower and the temporary bent, and the remainder of the truss was erected with the traveler. It was necessary to maintain an open channel for the passage of boats, and to meet this requirement it was necessary to erect the lift span in two sections. The easterly section remained fixed, while the westerly section, extending from Pier C to the rest pier of the swing span, was suspended from the temporary bent and the westerly tower by means of chain hoists.

The remaining 400-ft. span was erected from the old trusses, which were left in place until the erection was completed. East of Pier A, the method of erection was the same as that employed on the westerly span. The most easterly span of the finished bridge consists of trusses removed from the old bridge and reinforced. The total weight of the structural material in the completed bridge is 9,000,000 lb.

The foundations were constructed by the Missouri Valley Bridge & Iron Company, Leavenworth, Kan. The superstructure was fabricated and erected by the Mt. Vernon Bridge Company, Mt. Vernon, Ill. The operating machinery for the lift span was designed and installed by the Norwood-Noonan Company, Chicago.

The design of the foundations and superstructure and the execution of the work were under the general direction of E. F. Mitchell, chief engineer, and C. P. Howes, bridge engineer. Ralph Modjeski, consulting engineer, acted as consulting engineer on both the design and methods of construction, and Daniel Moran, consulting engineer, New York, co-operated on matters relating to the design and the construction of the foundations. P. P. Angier, resident engineer, was in charge of all field work.

St. Louis Roads Admit Losses Through Reciprocity

THE problems of the Southwestern roads in combatting reciprocity and the further activities of R. O'Hara, freight traffic manager of Swift & Company, in influencing railway purchases were brought out at hearings held at St. Louis, Mo., July 8-14, by the Interstate Commerce Commission, when officers of the Missouri-Kansas-Texas, the St. Louis-San Francisco and the Wabash explained their purchasing practices. Losses of traffic incident to the larger buying power of competing lines were admitted and a parallel was drawn between reciprocity and the free transportation hysteria, at the hearings which adjourned on July 14 after officers of the Chicago & Eastern Illinois and the Chicago, Rock Island & Pacific were questioned about their fuel purchases.

Frisco Methods

On the St. Louis-San Francisco, which spends about $18,000,000 a year normally for supplies, the purchasing department, according to B. T. Wood, vice-president, as well as the traffic and other departments, is interested in getting all the business it can for the road and frequently consults with the traffic forces before making purchases and likewise considers the recommendations of the traffic department, but in general, he stated, traffic enters very little in the buying program. This is because the road dislikes to keep changing its materials and because purchases are based on the lowest ultimate cost to point of use for satisfactory material. The traffic value of firms enters into the division of orders for such com-

modities as cement, fuel, oil, lubricants and coal but the purchasing is generally confined to firms located on the road and is divided largely by the territory to be served. He testified that the contract prices negotiated with the several firms for the same-purpose lubricating oils varied slightly but considered it better to divide such orders, and while able to buy spot fuel oil cheaper at times than contract oil, explained that the road contracts for 90 per cent of its fuel oil to assure a continuous supply in the face of its limited storage facilities. The only coal not purchased locally, he stated, was obtained in Illinois and all such coal was ordered as required, direct from the mines on the basis of competitive bids.

Frisco Shippers

J. R. Koontz, vice-president of traffic, testified that the road had lost traffic because of the larger purchases of other roads. While testifying further that the reciprocity pressure was not as acute at present as it was two years ago, a circumstance attributed to the reduced buying power of other roads, he agreed that it had harmful effects and mentioned the large number of companies like Sears, Roebuck & Company, never previously known as paint makers that were now in that business and the pressure on the road to spread its purchases to satisfy all of them. Like free transportation, he said, if all the roads push reciprocity to the limit, they will all be back where they started from.

A letter from H. L. Worman, superintendent of motive power, notifying Mr. Wood that he "did not see enough merit in this form of draft gear to warrant testing it out," was followed by a letter subsequent in which Mr. Worman said:

"Am anxious to get this order placed at once as by placing this order we are going to be able to help the traffic department in securing a very heavy shipment of molasses out of Mobile."

Mr. Koontz said that the influence leading to the placing of the order had come in the form of a request from the president of the Alabama, Tennessee & Northern, a road which was endeavoring to get the business away from the Mobile & Ohio and which had on its board of directors a stockholder of the Forsyth gear, who controlled the molasses traffic.

R. O'Hara and Coal

The letters also afforded another sidelight on the activities of R. O'Hara, freight traffic manager of Swift & Company, with the statement that R. O'Hara was diverting Swift & Company's business to other lines in order to force the road to buy coal from the Fleming Coal Company, in which he was a heavy stockholder, as well as to buy draft gear and bumping posts from the Mechanical Manufacturing Company. Mr. Wood stated that no coal was purchased from that company. He also testified that there was no agreement for a specific amount of traffic controlled by the National Sanitary Rag Company in return for the orders placed with that company for waste as one of the letters intimated, but that the manager of that company had only promised to reciprocate with the tonnage he controlled, consisting of hams and other produce.

Questioned regarding a letter in which the Mickle Timber and Lumber Company thanked the traffic department of the road for lumber orders placed with it by a car builder to be used on Frisco equipment, and assuring the road of return traffic, Mr. Wood said that contracts placed with car builders do not specify the mills from which the car lumber must be obtained.

G. E. Scott, purchasing agent of the Missouri-Kansas-Texas, which spends from nine to ten million dollars normally for purchases each year, testified that he is furnished with an annual statement of the traffic moved over the road by shippers and familiarizes himself with the traffic value of bidders before or after bids are received. In some cases, firms having traffic value, are told what price they must meet but his instructions are definitely not to pay higher prices to get traffic. The road departed this year from the practice of contracting for fuel oil requirements and purchases this commodity on a spot basis. He considered the price paid by the road for fuel oil of 25 cents per barrel was much less than other roads were paying at the time in the district and that while the same price is paid for commercial coal as that paid for the coal produced in company mines, the cost of the coal was comparable to the lowest prices paid by other roads. He had heard that the road had lost traffic as a result of reciprocity, explaining that the road's buying power was not as large as that of some other roads, and said it was true that reciprocity has increased the number of firms on the inquiry lists and makes it necessary to know more about the firms from which the road purchases its supplies. The policy of the road, he stated, is against buying through brokers.

R. C. Trovillion, freight traffic manager of the Missouri and Kansas lines since February, 1930, while not aware of any specific traffic lost because of reciprocity activities of other roads, said he had frequently received reports to that effect from other officers and agreed that the smaller line was at a disadvantage with roads that had larger purchasing power.

Wabash Methods

In making its purchases, which average around $14,000,000 per year normally, said T. J. Frier, purchasing agent of the Wabash, no reports of traffic are requested from shippers, but such reports are received from the traffic department in connection with important purchases and the recommendations of that department as to the allocation of orders are followed as far as practicable, preference being given, however, to industries located on the line. He specifically mentioned the application of the traffic rule to the purchase of lumber, which is bought from both wholesalers and mills, and to lubricants which are also divided so that the different grades of oil are supplied by different companies. The rule also applies to cement and coal. He said that 85 per cent of the coal requirements are purchased under annual contracts with operators located on the road in accordance with their previous year's traffic and the remaining 15 per cent week by week from mines in Pennsylvania, West Virginia and Ohio through accredited brokers, who can give the road patronage. The prices are based on quotations offered to the road monthly and the mines are designated. A higher price is paid for Illinois coal than for off-line coal to support the industries on the line, but the price, is about the same, he stated, as the delivered cost of the off-line fuel. The price paid in the southern district of West Virginia is $1.00 to $1.10 per ton.

O'Hara, Coal and Ice

Questioned about correspondence between the traffic department of the road and R. O'Hara, traffic manager of Swift & Company, regarding coal purchases from the Fleming Coal Company Mr. Frier stated that it was customary to buy coal from that company, and when referred to the comparative statistics of the coal purchased from and the traffic obtained from the various coal firms, he expressed the opinion that the much higher percentage of coal to traffic in the case of the Fleming

Company was the result of the friendship between the traffic manager of the road and R. O'Hara.

It developed that the Wabash, like several other roads previously questioned, has contracts for car icing with the Continental Ice Company (now controlled by the City Ice and Fuel Company) and that three other icing plants supplying the road with ice are now controlled by the latter. Mr. Frier said that he had little to do with the negotiations with the Continental Company which resulted in a 25-year contract for ice at Detroit and a year to year contract at Chicago, and did not recall that anything was said about traffic at the time but stated that R. O'Hara was interested in the subject. He further explained that the negotiations for the other icing arrangements were conducted with a St. Louis firm which had no traffic at the time but which was experienced in ice manufacturing and which the Wabash wanted to establish as an industry on its line.

F. D. Reed, vice-president of purchasing, Chicago, Rock Island & Pacific, appearing before the St. Louis hearing to answer statements in Missouri Pacific correspondence to the effect that the Rock Island had paid higher prices in certain oil fields to secure traffic, denied that such reports were true and explained that while distress fuel oil has been available in these fields from time to time at lower prices than those paid by the Rock Island, the road contracted for the fuel requirements in question at the lowest market prices at the time.

J. H. Beggs, purchasing agent of the Chicago & Eastern Illinois, testified that the purchases of that road are allotted on the basis of traffic and that while it has been possible to buy coal on foreign lines considerably cheaper at times than on the Chicago & Eastern Illinois, the policy of the road has been to confine its purchases to mines located on the road.

The hearings, following adjournment at St. Louis, were reconvened at Cincinnati on July 20, where W. J. Hiner, purchasing agent, J. E. Anderson, traffic manager, and H. A. Worcester, resident vice-president of the Cleveland, Cincinnati, Chicago & St. Louis, were called upon to discuss the reciprocity situation on that road and particularly to clarify the contents of 2,000 letters covering purchases or sales of coal, scrap iron, brass, cement, paint, roofing, lumber, oil and rope, and to answer questions on the contents of approximately fifty voluminous records of coal orders, coal traffic and coal prices.

Traffic Jobs Under Fire

A new line of inquiry was injected in the Cincinnati hearing when J. E. Anderson, traffic manager of the Big Four, following questions about alleged activities of the road's agents on foreign lines and the acquisition of Louisville & Nashville records on coal routings over the Pennsylvania, was asked by Examiner J. L. Rogers to show what benefit the public derived from traffic solicitation. Mr. Anderson did not recall off hand the cost of the road's solicitation expense but agreed it would be much more than $100,000 and that these expenditures would be a factor in fixing rates. He defended the traffic solicitation with statements that the solicitors were men of experience in railway transportation and were valuable to shippers, providing a service needed by the public. He agreed that a large part of the solicitation was directed to getting traffic away from other roads and that a substantial part of solicitation work by the carriers as a whole is of no benefit to the public. The Big Four, he said, would doubtless not maintain off-line agencies if traffic solicitation were entirely eliminated.

Western Livestock Rates Revised

WASHINGTON, D. C.

ASSERTING that livestock in portions of the western district is not bearing its fair share of the "transportation burden," but that it cannot sustain a rate level which will produce more than the cost of rendering the service plus a minimum of profit, the Interstate Commerce Commission has ordered a general revision of freight rates on livestock throughout the western district which Commissioner Porter, dissenting, said it was estimated would result in an increase of approximately 10 per cent in western trunk-line territory and reductions of 6 per cent and 1.75 per cent in the Southwest and Mountain-Pacific territories, respectively.

No estimate of the effect was given in the majority report in Part 9 of the rate structure investigation, made public on July 17, which said that under the rate levels found reasonable livestock will do no more than meet the minimum requirements, but Commissioner Lewis, dissenting in part, said that inasmuch as the increases generally affect short hauls in which the movement to market is now largely by truck, "the results will not be burdensome to the shippers or productive of much increased revenue to the carriers, which will probably have to meet the competitive transportation charges."

Commissioner Porter objected to the rates prescribed as "in utter disregard of the mandate of Congress" as expressed in the Hoch-Smith resolution, under which the investigation of livestock rates was made, and said that while the commission has published reports in seven of the thirteen investigations under the resolution, five of them affecting agricultural products, and has also decided many other important cases involving agricultural products since 1925, "in not a single instance did we prescribe a substantial rate increase, but on the other hand in many of them we have granted substantial reductions."

The new rates, to become effective on October 27, are included in a single mileage scale for application in western trunk line and southwestern territories, another for application in Mountain-Pacific territory, and another of arbitraries to be applied to interterritorial hauls. The scales include three columns, for cattle, calves, hogs, sheep and goats, in double-deck cars; for calves and hogs in single-deck cars, and for sheep and goats, in single-deck cars. The cattle rate begins with a rate of 11 cents for 10 miles, reaches 20 cents for 100 miles, 42 cents for 500 miles, 62 cents for 1,000 miles and culminates with 122 cents for 2,500 miles. The single-deck rates are slightly higher. Rates on stocker and feeder livestock are not to exceed 85 per cent of the rates prescribed for fat livestock. The new rates are to supersede scales of distance rates heretofore prescribed by the commission covering a great deal of the traffic as well as many rates between points not covered by the scales initiated by the carriers.

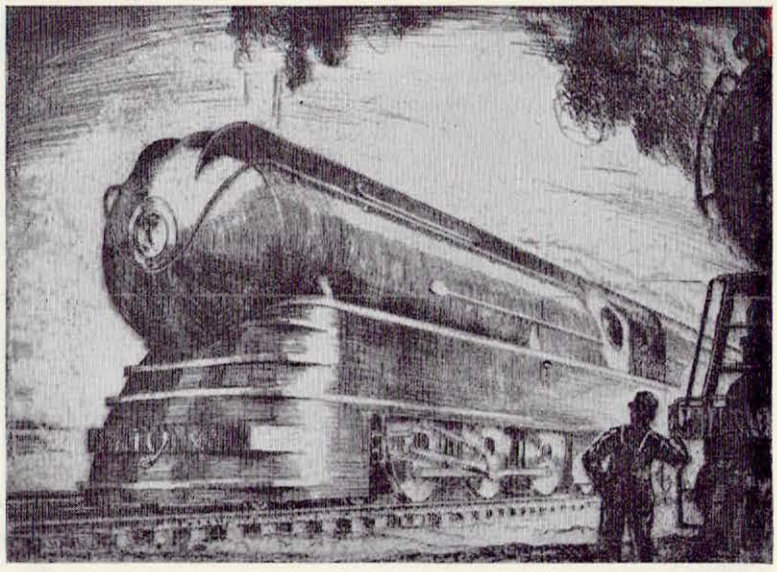
Testimony offered on behalf of the livestock industry took the position that a depression still exists in that industry and urged a reduction of existing rates, while the railroads urged their need for higher rates in view of the conditions under which livestock is transported and their financial condition. The Public Service Commission of Nevada had asked for a reduction amounting to 25 per cent in present rates suggesting that the revenue be made up by a flat increase of ten cents per ton on all

(*Continued on page 138*)

Making Steam Locomotives Beautiful

An engineer with an artistic bent makes some suggestions—Railroads have not taken advantage of the romance surrounding the locomotive in advertising through-train service

By O. Kuhler*



Etching by O. Kuhler

MILLIONS of dollars have been spent by the railroads on improving their through-train service. De luxe trains, such as the Twentieth Century, the Broadway Limited, the Capitol Limited, the Yankee Clipper, the Empire Builder, and the list could be continued for at least a column, have cost a lot of money and must cost considerable to maintain. Considering the decline in passenger business since 1921, some of the return expected by railway executives from the money spent on these trains must be in advertising and good will.

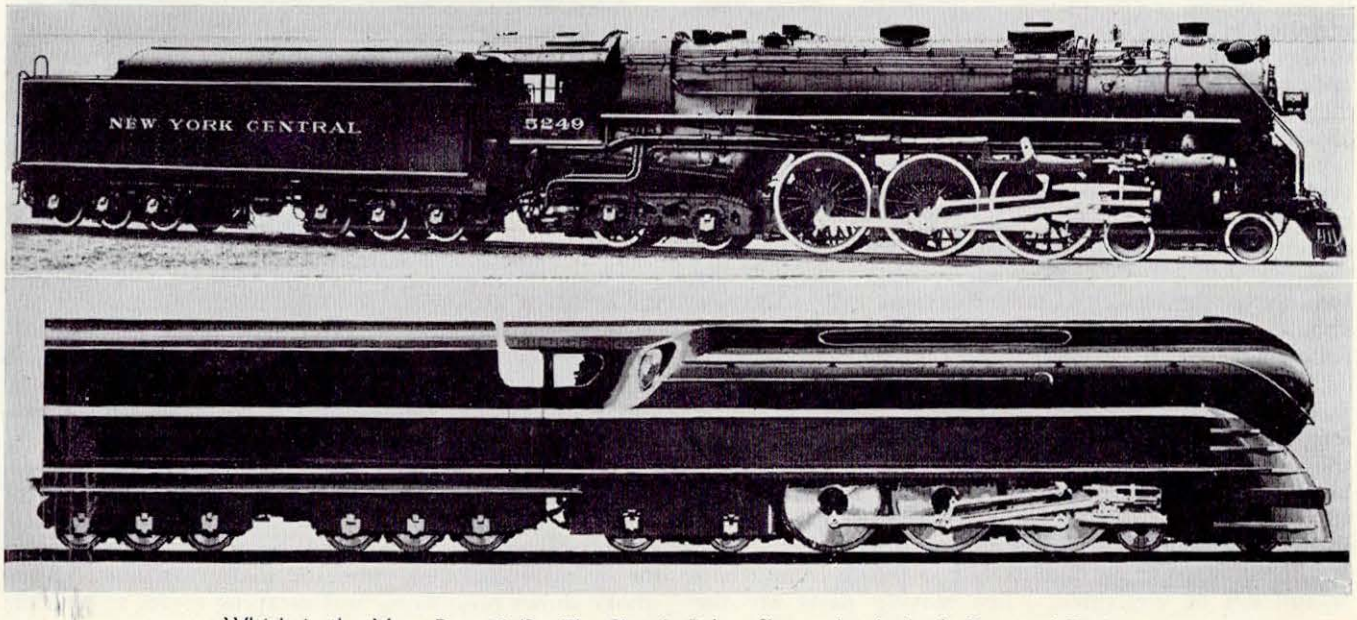
Being an extensive traveller, not only in this country but abroad, the writer has occasion to ride on many of the crack trains referred to. On such occasions he has been impressed with the fact that, although the coaches are luxuriously equipped and furnished with the latest for the convenience, comfort and enjoyment of the patron, the locomotive has been sadly neglected.

True, the locomotive may bear a name; it is usually clean and the paint is fresh. In many instances the side rods, valve motion and cylinder heads are polished, or even chromium plated. In a number of cases the hand rails are of polished brass or nickel finish. Nevertheless, much of the romance and soul-stirring qualities of the locomotive have been overlooked by both the railroad and the builder, especially when considered from the viewpoint of the artist who specializes in advertising.

Passenger Locomotives Should Give Impression of Speed

There are few men today who have not at some time in their lives entertained ambitions to become locomotive

* A reproduction of an etching by Mr. Kuhler, entitled "The First Step," appears on page 55 of the January 5, 1931, issue of the *Railway Age*.



Which is the More Beautiful?—The Sketch Below Shows the Author's Proposed Design

enginemen. There are undoubtedly many women to whom the heroic aspects of an engineman's vocation have their appeal. The idea of speeding through the storm or through the night certainly has a stirring appeal.

The popular press frequently refers to one of our large modern locomotives as a "Mogul". Undoubtedly the comparative impression of the old Mogul (2-6-0) type locomotive was that of speed as well as of power, probably because of the three pairs of driving wheels and the length of the boiler as compared to other locomotives at that time. Length gives the impression of speed.

The development of the trailing truck and, with it, the Prairie (2-6-2) and Pacific (4-6-2) type locomotive resulted in better-appearing locomotives. Many of the American (4-4-0) and Atlantic (4-4-2) types were too high and short and the boilers too small to present a striking appearance. The most striking feature of these locomotives was the large diameter of the driving wheels.

Undoubtedly the 4-6-2 type locomotive was the best product of the designer from the viewpoint of the artist or architect. The Pacific type has been the inspiration for many poets, composers, artists and sculptors.

Nevertheless, the railroads seldom capitalized on the real value of the Pacific type as an advertising medium to secure business.

The 4-6-4 type, in fact all of the modern power having four-wheel engine and trailing trucks, affords unlimited possibilities largely because of the increased length and the opportunity to streamline.

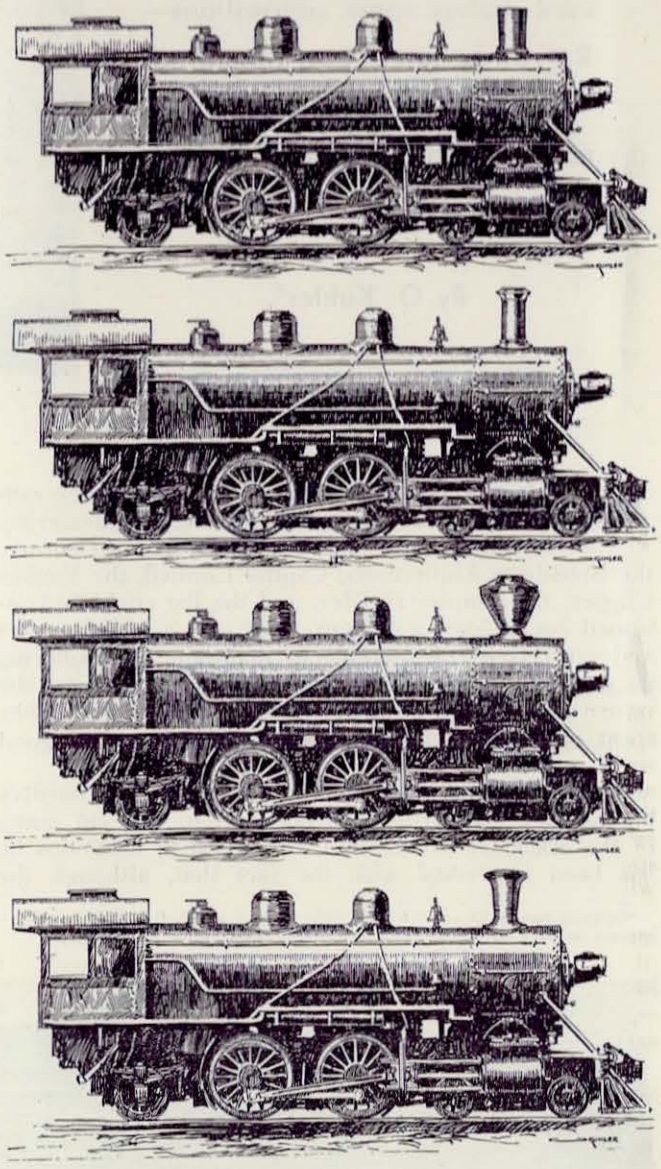
Take, for example, the New York Central 4-6-4 type shown in one of the illustrations. This locomotive is a beautiful piece of machinery. The general appearance and outline gives one an impression of power. The large driving wheels convey the idea of speed. However, speed could be accentuated considerably if the running board had been continued in an unbroken line from the smokebox to the rear of the cab. The continuous hand rails and piping along the boiler tend to give a streamline effect. The vertical pipe located on the side of the boiler in rear of the stack, the piping in front of the sand dome, and the two pipes to the booster should be concealed. Visible piping should be horizontal and of considerable length and not vertical to the running board, or top of the boiler. Sand pipes installed to lead directly from a centrally located dome to the front and back driving wheels spoil the appearance of a locomotive. The present tendency to conceal all piping under the jacket is a step toward improved appearance.

Shown directly beneath the New York Central 4-6-4 type is a sketch of the same locomotive with a more modernistic jacket design. It will be noted that the sketch retains those attributes of the steam locomotive that are distinctively American, such as the pilot, the location of the headlight, and the large cab. America should never attempt to beautify its locomotives by following foreign design.

The striking streamline effect is the breaking away from tradition. But that is typically American. The long streamlines accentuated by the straight top from the stack to the rear of the tender; the hand-rail; unbroken running board, the line of which is carried back to the rear of the tender, and the bottom stripe, all tend to impress the mind with the idea of speed.

The driving wheels, side rods and piston connections should not be concealed. The moving parts are the important impressionistic items conveying the idea of speed.

As to the comparative wind resistances of the two jacket designs, no study has been made. However, the wind resistance of the 4-6-4 type locomotive shown in the sketch must be considerably less than the locomotive now in service. Undoubtedly, the exposed portion of the locomotive showing the driving wheels and rods would create "wind pockets" and set up some wind resistance. Locomotives designed to minimize wind resistance and at the same time to be beautiful



The Same Locomotive—The Only Difference Is the Stack

will have to be a compromise between the engineer and the artist or architect.

In the sketch of the 4-6-4 type locomotive no attempt has been made to show compliance in the details of safety appliances. However, compliance with the law in this respect should present no serious difficulties.

Effect of the Stack on Appearance

Railroad men object and frequently show signs of irritation when pictures of locomotives are shown with smoke rolling out of the stack or steam escaping from the cylinder cocks or from the piston packing. Black smoke shows poor firing and escaping steam around the

cylinders is not only poor maintenance, but a federal defect.

However, the layman knows nothing of these things. Smoke from the stack and escaping steam afford the same thrill as the cannons belching forth smoke and flame in the well-known painting of the Battle of Santiago published in our old school histories. For that reason the stack is one of the most important parts of a locomotive from the viewpoint of the artist.

One of the illustrations shows four sketches of a 4-4-2 type locomotive. All four are the same, with the exception of one detail—the stack. Note that the effect of a stack set well backward on the smokebox, together with small-diameter driving wheels, is that of power.

The stack, slightly enlarged in a straight taper toward the top and a little higher than the sand dome, which is shown in the top sketch, is typical of many locomotives seen today. The stack on the locomotive shown in the second sketch is smaller in diameter and somewhat taller. This, together with the ornamental top, tends to give an impression of greater speed than the stack shown in the top sketch. Likewise, the stack shown in the lowest sketch gives the appearance of speed. The wood-burner type of stack suggests power and ruggedness. Note that the location of the headlight is not ornamental and does not appear to fit into the general outline of the locomotive. For the type of locomotive shown, the headlight would look better on top of the smokebox ahead of the stack. The broken line of the running board tends to accentuate the squatty appearance of the locomotive.

It will be noted from the sketch of the streamlined 4-6-4 type locomotive that the effect of the stack has not been overlooked. This form of streamline jacket, for which a patent is pending, can be designed to provide easy access to all parts and appurtenances. The side shield covering the upper portion of the drivers is hinged and lifts upward. The rounded nose opens to either side to permit access to the front end, air compressor, etc. The smoke-box cowl lifts upward.

It is useless to try to improve on it with shiny lacquer-work or brass as the form of this locomotive is beautiful in itself. It would be ridiculing the expression of serious efficiency. The boiler is painted in a dark battleship grey. The frames are painted black. All rods and valve-motion work are polished. Every line, like the hand-rail, running board, etc., that runs parallel has been accentuated by the use of stainless steel. These parallels are also carried through on the tender. Between the domes a space for an electric light sign has been provided, and may be used carrying the name of the train.

Principles Affecting Appearance

Some important points to consider in the design of a locomotive to achieve certain effects are:

Carrying the running board straight through the cab gives the impression of height. As we are accustomed to compare the size of machinery with the height of a man, the locomotive appears larger than it actually is.

Striping the sides of the cab to follow the outline of a panel tends to destroy the effect of both height and length.

Dome and sand box covers should be at a minimum height on the boiler and spaced between the stack and cab to produce the best effect. A considerable improvement in appearance could be had by placing all appurtenances located on top of the boiler under a single cover.

The present practice of concealing all piping under the jacket is sound from the artistic viewpoint. However, a long stretch of horizontal piping along the side of the boiler does not present a bad appearance and frequently accentuates the appearance of length.

Enclosing the driving wheels will give the effect of a ship rather than that of a locomotive.

The front-end appearance can be considerably improved and made more striking by concealing the headlight casing in the smokebox door.

Locomotives having water-tube fireboxes look better because of the continuous horizontal bottom line.

Belpaire fireboxes always present a bad appearance on account of the square shoulder where the top sheet joins the cylindrical boiler shell.

Pipes or brackets attached to the stack look very bad. The stack should be clean of all appurtenances from top to bottom.

The outline of the tender is extremely important. Care should be taken by the designers to see that the outline of the tender blends well into the outline of the engine to give the impression of being one piece of machinery rather than two.

The highly decorated locomotives of early days did much toward selling railroad transportation to the public. The railroads have again arrived at the point where new media for advertising and selling are required. They are not making effective use of the best piece of equipment in the train for its popular appeal.

The 4-6-4 type suggests the power and beauty of the large stationary engine. The proposed form suggests both beauty and speed. If locomotives were designed with the same careful attention to beauty as is now given to efficiency and to economical maintenance, a new interest in the railroad would be aroused.

N. Y. Central Watches Its Operating Expenses

THE New York Central has recently issued its report for 1930—its first year as a unified company, following its leasing of its principal subsidiaries, including the Michigan Central and the Cleveland, Cincinnati, Chicago & St. Louis. These leases, it is true, were not effective until February 1, last year, but the report includes the statistics for these companies for the full year, to aid comparisons. The New York Central thus becomes a unified system of 11,422 miles of line.

Traffic and earnings for the year were, as elsewhere, disappointing. Operating revenues were $478,918,347, a decrease of $111,090,275. Revenue freight amounted to 150,046,279 tons, a decrease of 26.16 per cent, the revenue therefrom being $307,177,575, a decrease of $74,803,799 or 19.58 per cent. Decreases in tonnage were general throughout the list of commodities handled, there having been only a few increases and these of relatively minor importance. The company carried 72,951,015 revenue passengers, a decrease of 6,264,077. The revenue received from passenger business amounted to $111,184,744, a decrease of $19,877,511.

Operating expenses decreased by $64,516,175 to a total of $376,729,417. Net revenue from railway operations totaled $102,188,929, a decrease of $46,574,100. The operating ratio rose from 74.78 in 1929 to 78.66 in 1930. Maintenance of way expenses in 1930 declined by $9,543,456 to $64,832,895; maintenance of equipment by $25,895,778 to $103,757,393. Transportation expenses totaled $174,455,031, a decline of $28,241,363.

Net railway operating income was $57,235,527, a decrease of $46,467,252. Net income amounted to $35,981,791, a decrease of $41,446,791, the decrease in net railway operating income being partly offset by an increase of $5,594,969 in non-operating income. The net

income per share of stock outstanding at the end of the year was $7.21, on the basis of including for the full year the figures for the lines leased on February 1, 1930. Dividends amounting to 8 per cent were paid during the year and charged to accumulated surplus.

The amount at which the total assets of the company were carried on its balance sheet of December 31, 1930, was $1,800,075,289, an increase of $78,378,157 over December 31, 1929. The total corporate surplus on December 31, 1930, was $290,275,410, or more than $58 for each 100-par share of stock outstanding. Capital stock outstanding at the end of the year amounted to $499,259,735, the number of stockholders being 56,635, and the average holding 88 shares. The ratio of capital stock to total capitalization at the end of the year was 43.97 per cent.

Negotiations were concluded or nearing conclusion for the acquisition of a number of short lines in New York Central territory, the most important of which is the Ulster & Delaware, plans for the acquisition of which are now in the final stages.

The Cleveland Union Terminal project was opened for operation on June 29, 1930. Substantial progress was made in the construction of the new Waldorf-Astoria Hotel, located on the block between Forty-ninth and Fiftieth streets and Park and Lexington avenues, New York, under lease to the Waldorf-Astoria Hotel Corporation. It is expected that it will be completed by October 1, this year. Relocation work on the Putnam division between Briarcliff Manor and Eastview, New York, was nearing completion at the close of the year. Progress was made in the development of facilities at Buffalo, embracing a wholesale fruit and produce market and fruit auction house for the handling of fruits and vegetables, enabling the company to participate to a greater extent in this character of traffic.

Substantial progress was also made in the acquisition of land for right-of-way purposes in connection with the West Side improvements in New York and contracts were awarded for the construction of most of the foundations for the structure to carry the elevated tracks south of West Thirtieth street. Work on this project at the present time is proceeding rapidly.

Construction of a modern brick and concrete freight station with suitable track facilities at East Fortieth street, Cleveland, was commenced during the year. It is proposed to lease this facility to the Universal Carloading & Distributing Company, for the purpose of the assembly and consolidation of l.c.l. freight into carloads and also for the handling of l.c.l. shipments.

At the close of the year the grading for the new passenger terminal at Cincinnati was about 67 per cent completed. Practically all of the land necessary for the improvement has been acquired. Construction by the City of Chicago of the new channel of the Chicago river was completed at the close of the year and the New York Central and the Rock Island came into possession of their portion of the land acquired under the river straightening ordinance. A new suburban coach yard was constructed upon this land in the vicinity of Sixteenth street in substitution for like facilities at La Salle Street Station, thus permitting the construction of additional station tracks and platforms at that station.

The heavy decline in freight business during the first four months of 1931, as compared with the same period of 1930, is reflected in the accompanying table of selected freight service operating statistics for the two periods for the New York Central proper, the Big Four and the Michigan Central. The table also reflects the steps being taken to meet the declining traffic with economies in transportation expense. Thus it will be noted that the New York Central proper, while suffering a decline of 13.4 per cent in gross ton-mileage was able to reduce its train and locomotive mileage by even greater percentages and its freight train-hours by no less than 18.9 per cent. Train speed and both gross and net ton-miles per train-hour were substantially improved, as was fuel economy.

The Big Four likewise reduced its train and locomotive mileage by a percentage greater than that of the decline in gross ton-miles and train speed and both gross and net ton-miles per train hour showed remarkable betterment. Fuel consumption per thousand gross ton-miles declined 6.5 per cent. Improvements of like sort were shown by the Michigan Central which was able to reduce its train-hours by 23.2 per cent and bring its average freight train speed up to 18.6 miles per hour.

The New York Central in the first five months of the current year had operating revenues of $165,681,886 and operating expenses of $132,599,040, making the operating ratio 80 per cent. Net railway operating income for the five months totaled $12,991,363, as compared with $25,823,142 in the same period of 1930.

New York Central—Comparison of Selected Freight Operating Statistics—Four Months

	N. Y. C.				C. C. C. & St. L.				M. C.			
			Per cent of change				Per cent of change				Per cent of change	
	1931	1930	Inc.	Dec.	1931	1930	Inc.	Dec.	1931	1930	Inc.	Dec.
Mileage operated	6,477	6,468	0.1		2,721	2,712	0.3		1,869	1,854	0.8	
Gross ton-miles (thousands)	15,382,541	17,771,101		13.4	4,904,372	6,078,965		19.3	3,136,551	3,871,156		19.0
Net ton-miles (thousands)	6,179,533	7,404,587		16.5	2,179,164	2,748,527		20.7	1,052,371	1,314,235		19.9
Freight train-miles (thousands)	6,693	7,789		14.1	2,461	3,120		22.1	1,649	2,021		18.4
Freight locomotive-miles (thousands)	7,775	9,206		15.6	2,646	3,314		20.2	1,698	2,090		18.8
Freight car-miles (thousands)	413,595	477,675		13.4	126,025	154,720		18.6	89,674	112,916		20.6
Freight train-hours	457,236	564,020		18.9	155,267	215,877		18.1	88,587	115,358		23.2
Car-miles per day	24.5	28.9		15.2	22.6	27.5		17.8	17.6	24.5		18.2
Net tons per loaded car	24.9	25.7		3.1	28.7	29.7		3.4	19.3	19.4		0.5
Per cent loaded to total car-miles	60.0	60.4		0.7	60.3	59.8	0.8		60.8	60.1	1.2	
Net ton-miles per car day	366	449		18.5	391	488		19.9	207	285		27.4
Freight cars per train	62.8	62.4	0.6		52.2	50.6	3.2		55.3	56.8		2.7
Gross tons per train	2,298	2,282	0.7		1,993	1,949	2.3		1,902	1,916		0.7
Net tons per train	923	951		3.0	885	881	0.5		638	650		1.9
Train speed, miles per train hr	14.6	13.8	5.8		15.9	14.5	9.7		18.6	17.5	6.3	
Gross ton-miles per train-hour	33,642	31,508	6.8		31,587	28,159	12.2		35,406	33,558	5.5	
Net ton-miles per train-hour	13,515	13,128	2.9		14,035	12,732	10.2		11,880	11,393	4.3	
Lb. coal per 1,000 gross ton-miles	106	111		4.5	116	124		6.5	113	117		3.4
Loco. miles per loco. day	47.8	57.2		16.4	51.6	60.6		14.9	65.8	76.4		3.8
Per cent freight locos. unserviceable	34.7	23.6	47.0		32.7	30.7	6.5		28.2	19.6	43.9	
Per cent freight cars unserviceable	9.0	4.4	104.5		5.1	4.2	21.4		5.4	4.1	31.7	

Railway Emergency Before I.C.C.

Commissioners and shippers question ability of traffic to stand rate increase

WASHINGTON, D. C.

TESTIMONY portraying the present railroad situation as a potential threat to the financial and industrial structure of the nation, following a long period during which the roads have not received a fair return and therefore have not been able to accumulate sufficient reserves to tide them over a long period of depression, was presented at the hearing on their application to the Interstate Commerce Commission for authority for a general 15 per cent advance in freight rates. The hearing was held before Commissioners Meyer, Lewis, Lee and Eastman and a committee of state commissioners, beginning on July 15 and continued this week until July 21.

The presentation of the railway's case was concluded on July 17, after three days, a much shorter time than they have ever taken to present a similar case before and in keeping with their plea that the case be expedited as an emergency matter. It was followed by testimony by representatives of the security-holders, lake lines, short lines, and chambers of commerce who are in favor of the rate advance, after which Commissioner Meyer, who presided, offered an opportunity for any "neutrals" or "adversaries" who were ready to be heard. It appeared, however, that the "adversaries" had held a meeting and resolved that they would need until August 31, the date originally set by the commission, to prepare their "defense" and the only adversary to appear was Benjamin C. Marsh, executive secretary of the People's Lobby. The commission then heard argument on Tuesday afternoon on a motion offered by Grenville Clark, counsel for the insurance companies and savings banks, that, in view of the emergency, the commission change its program and remain in continuous session, restricting the time allowed for testimony, with a view to concluding by August 15 and reaching a decision by September 1. The commission took this motion, together with a suggestion by H. W. Bikle, of counsel for the railroads, that they would be satisfied if the commission would take a recess of ten days or two weeks and conclude the hearings by August 30, under consideration. The idea of a postponement was vigorously opposed by representatives of the shippers.

While the railways told the commission they were not asking for anything like the fair return contemplated by the law at this time, they asked the commission, in effect, to reverse the process by which for ten years it has been tinkering with the adjustment of rates, while waiting for the usual increase in traffic volume to give the roads an opportunity for a fair return. They asked that this time the commission increase the general rate level sufficiently to preserve the credit of the railroads and tinker with the adjustments later.

The Class I railways presented only six witnesses: Dr. Julius H. Parmelee, director of the Bureau of Railway Economics, and R. H. Aishton, president of the American Railway Association, whose testimony was reported in last week's issue, followed by J. J. Pelley, H. A. Scandrett and W. R. Cole, chairman of the special committees of presidents of the roads in the Eastern, Western and Southern districts, and Roy S. Kern, chairman of the coal and coke committee of the Central Freight Association, who explained the proposal for preserving certain group differentials. The statements of the railway executives were short and general, and much of the time of the three days was taken up with replies to questions from the bench, of a nature which gave no particular encouragement to the railways, and to requests for information or cross-examination by the large number of shippers' representatives present.

Eastman and Meyer Emphasize Difficulties

In the barrage of questions the most active part was taken by Commissioner Eastman, who sat throughout most of the hearing although he is not one of the three commissioners especially assigned to the case, and who sought to emphasize an inconsistency between the position now taken by the railway executives and the previous action of their traffic departments. He also questioned the possibility of obtaining an increase in revenues at this time by a rate increase.

Commissioner Meyer good-naturedly chided the railway executives several times for the statement in their application that the railways were without power to increase rates without the approval of the commission, and said that they had been at all times free to propose increased rates on any commodities. Commissioner Eastman asked so many questions that Commissioner Meyer once asked if any one had a question that he had "inadvertently omitted." Commissioner Lewis on several occasions asked if the railways are not asking for an increase and then a free hand to make reductions later. Paul A. Walker, of Oklahoma, plainly indicated his hostility to the railroad application, and Hugh White, of Alabama, devoted a great deal of time to rather critical questions, mostly on non-essentials.

Testimony of Executives

Stressing the "serious emergency", J. J. Pelley, president of the New York, New Haven & Hartford and chairman of the committee of presidents of Eastern carriers, told the commission that a 15 per cent advance in rates is the only way in which it can be met. "The railroads' net earnings are fast approaching the point where they may be insufficient to meet the relationship to fixed charges that has become generally established and recognized as an investment standard," he said. "If earnings fall below this standard many railroad securities, because of various state legal requirements, can no longer be disposed of to savings banks and insurance companies, thus seriously limiting the market for railway securities. Furthermore, the earnings of the railroads are now such that they are unable to maintain their normal capital and maintenance expenditures. The curtailment in the purchasing power of the railroads has, in my judgment, a strong influence in retarding the recovery of business."

H. A. Scandrett, president of the Chicago, Milwaukee, St. Paul & Pacific and chairman of the committee of presidents of Western carriers, stated that the rate of return now being earned by the Western lines is the

lowest of the last thirty years with the single exception of 1920, in which year the commission authorized general increases in rates. In the first four months of 1931 the western railways were earning a return, on an annual basis, of only 1.76 per cent upon their property investment. "From 1901 to 1910," Mr. Scandrett testified, "the average rate of return earned by the western lines was 5.31 per cent; from 1911 to 1920 their average return was 4.11 per cent; while from 1921 to 1930 this average was 3.78 per cent. If, from the second decade, the years of the United States Railroad Administration (1918-1920) are eliminated, the figure for that decade is 4.72 per cent. The carriers in the western district have never since the passage of the transportation act in 1920 earned the fair return to which they are entitled.

"It would also be highly desirable, in this period of lowered costs," he continued, "to resume in volume programs of railway improvements which have been largely suspended. Such action at this time would be most helpful in relief of unemployment. However the credit of the western carriers is so impaired that few of them could now obtain money for additions and betterments by the sale of their securities at a price which they, or the commission, would regard as in keeping with prudent management. I can think of nothing that would longer postpone the return of prosperous condition in this country than a breakdown of rail service."

W. R. Cole Cites Provision of Transportation Act

W. R. Cole, president of the Louisville & Nashville and chairman of the committee of presidents representing the Southern group of carriers, said that in 1930, the earnings of the railways in the Southern region were only 1.35 times their fixed charges, and that with the enormous decrease in earnings during the current year, "it is evident that the availability of most railroad bonds for investments by savings banks is not only seriously threatened but will certainly be destroyed if some way is not found to improve railway earnings. It would be difficult to overestimate the potential threat to our entire financial and industrial fabric which this situation discloses.

Section 15A an Empty Gesture?

"If the railroads are to be deprived of a fair return during periods of prosperity on the ground that they are not confronted with any emergency requiring it, and likewise are to be deprived of such fair return during periods of depression on the ground that general conditions do not admit of it, then it is obvious that at no time can they hope to receive the fair return on their property as required by both the common law and the statute law, and the rate-making provision of Section 15a of the transportation act, as indicated by Congress, becomes an empty gesture."

Cross-Examination of Railway Executives

The queries of the commissioners indicated that the request that the case be considered on a revenue basis without investigation of the reasonableness of particular rates, would not encounter smooth sailing and that the commissioners are concerned as to the effect of the increase on various kinds of traffic.

After Commissioner Eastman had made a point of the fact that the railroads were proposing to offer no traffic witnesses, Mr. Bikle said that the executives had consulted their traffic departments and asked Mr. Pelley what they had recommended. Mr. Pelley replied they had said that a general percentage increase was the only practical way to meet the situation because it would take too long to consider particular rates separately, but that specific rates could be considered later. Commissioner Eastman asked whether the plan for increasing rates was initiated by the traffic departments or the executives. Mr. Pelley said he did not know just who initiated it, but he said it was done by the railroad officers rather than by the security-holders.

Commissioner Lewis asked many questions as to when or what downward adjustments would be made after the application of the percentage. Mr. Pelley said that no one could say. Commissioner Lewis remarked that the carriers seemed to be agreed that a percentage increase should be made but not as to how long it shall stay in effect. Commissioner Meyer remarked that the commission had heard of many rumors "around the fringes of this case" and asked if there had been any understandings with large shippers that in a month or two some of them will be "taken out from under" the 15 per cent increase. Mr. Pelley said he knew of no such agreement.

Commissioner Eastman said that the statement had been made in his office last Fall that the New Haven could not possibly increase rates in the first four classes above the present levels and asked if that opinion had been changed. He also cited case after case in which the railroads recently have asked authority to reduce rates below the levels fixed by the commission, usually to meet water or truck competition, and asked if the traffic departments had now advised that that traffic could bear a 15 per cent increase. Mr. Pelley said they had not reported specifically.

De Luxe Trains Making Money

Commissioner Lewis asked if consideration had been given to reducing passenger service expenses, particularly where there is duplication, saying that the passenger business is a "tremendous loser." Mr. Pelley said that any saving that could be effected would be very small and that the New Haven had been putting on new de luxe trains that were making "handsome returns." "We are spending money all the time," he said, "to keep people riding on our trains."

Roads Disappointed at Delay

Replying to a question by Commissioner Lewis, Mr. Pelley said that the railroads were somewhat disappointed at the length of time allowed by the commission before the hearings are to be resumed on August 31, although he said he believed a reasonable time should be allowed before the testimony of protestants. "Our view is that unless someone can show that we don't need the increase, or has a better plan, there is very little to be said in opposition," he said.

Commissioner Lewis asked Mr. Scandrett about many situations in the west in which the roads have asked authority to cut below rates prescribed by the commission to meet pipe-line, truck or water competition or where long-haul rates would be increased more than short-haul rates on competitive traffic by the percentage plan. When Mr. Scandrett said those situations would have to be taken up specifically in the light of the new conditions, Mr. Eastman asked whether the traffic men have "lost control" or whether they have changed their minds since they asked the commission to allow them to reduce rates on petroleum, cotton, etc.

Mr. Scandrett said he did not think any traffic man could say now what rates would have to be to meet competition, and when asked if the roads propose to apply the 15 per cent to traffic on which they have been

reducing rates he said: "As an initial matter, yes, but I would not be surprised if some readjustments would have to be made."

J. Van Norman asked Mr. Scandrett if it is the position of the carriers that where the commission has fixed maximum reasonable rates it has authority to order increases on a showing that the railroads need money. Mr. Scandrett said he thought it had. Commissioner Meyer asked if it could authorize any rates other than those found to be just and reasonable by the ordinary tests. Mr. Scandrett replied that when an entire body of rates produces too low a return that shows that the general level is too low and that it can be corrected only by a general levelling up.

"If the commission should conclude that it must also consider the ability of the traffic to stand the increase where would we find that evidence?" asked Commissioner Meyer. "I think that involves a question of managerial responsibility," replied Mr. Scandrett. We assume we are entitled to a 15 per cent increase. We are not going to try to get less money. Whether it would be wise to try to take the full 15 per cent on all traffic I should say would be a question of managerial responsibility. I do not think you should investigate the lumber rates, for example. If we are wrong we shall have to make a second guess."

In reply to a question as to whether the railroads intended to make the increase permanent, Mr. Bikle announced on July 16 that as it was obviously impossible to forecast how long the depression would last it seemed impossible to set a date for the expiration of the rate increase but that the railroads would be willing to have the commission keep the case open for such action as may be necessary later.

Discussion of Wages Barred

Mr. Scandrett was asked whether he thought railroad wages are too high, and said he thought it was the general opinion of railway executives that a readjustment of wages would be inadvisable at this time, but Commissioner Meyer interrupted to say that "for the purpose of this proceeding we shall have to deal with wages as they stand, because they are under another authority." John F. Finerty asked if the railway executives at any time had considered a general reduction of rates with a view to stimulating traffic. When Mr. Scandrett replied that they had not, he asked if they had not reduced many rates for that purpose. "That was not to stimulate traffic," said Mr. Scandrett. "That was to recover traffic from the trucks."

Most of the time of the third day was devoted to questioning of Mr. Scandrett and Mr. Cole, although Commissioner Meyer tried to shorten it a little after Mr. Scandrett had been asked if one of the reasons for the condition of the railroads was not the fact that some passenger brakemen wear overalls while bus drivers have spick-and-span uniforms.

Some Shippers Want Exceptions

The cross-examination consisted mainly of argument between the shippers' representatives and the railroad presidents as to why the railroads had not agreed in advance to make exceptions of particular kinds of traffic on the ground that rates had recently been readjusted or advanced already by the commission, or reduced by the carriers to meet competition, or that an increase would subject long-haul rates to greater increases than short-haul competitive rates. Mr. Cole said that if the railroads had attempted to make some such exceptions and not others a fight of Kilkenny cats would be a mild performance as compared with that which would be staged before the commission.

After Mr. Cole had made some comparisons with the percentage method adopted in the 1920 rate case Commissioner Eastman asked if a commodity price index of 107 in 1931 as compared with 225 in 1920 did not indicate a different condition. When Mr. Cole said he did not admit that the condition of industry has any relation to the propriety of the railroad request for an increase Mr. Eastman asked if it does not have something to do with the possibility of getting an increase in revenues. After questioning Mr. Cole for some time as to the extent to which he had consulted his traffic department as to the ability of the traffic to bear increased rates Mr. Eastman said: "I understand that whatever the facts are as to the effect on traffic you would still persist in increasing all rates."

A Surplus of Transportation?

Commissioner Lewis asked if we are not confronted with a situation growing out of a surplus of transportation, including waterways, pipe-lines, trucks and buses. If the railroads had substantially more traffic they would not be faced with the emergency, Mr. Cole replied, "but," he said, "if it is considered that the railroads are a moribund industry then of course the thing to do is to send them to the undertakers and give them a decent burial. If they are not they must be maintained and those who want to use them must pay the bill."

After having been asked many times as to whether he thought the traffic would bear a 15 per cent increase, Mr. Cole referred to the studies made by the Bureau of Railway Economics into the fluctuations in prices of commodities, showing great variations having no relation to freight rates, and said that if the railroads should offer to haul wheat for nothing it would make no change in the price of wheat, which is governed by conditions of supply and demand. Mr. Cole expressed the opinion that the trucks might raise their rates and still keep them under the new rail rates. "We are led to understand that they are not making money by double-handfuls," he said.

Railroad Situation Likened to That of Germany

Declaring that "the country as a whole has no conception of the seriousness of the railroad financial emergency" and comparing it in some respects with the condition of Germany Fairman R. Dick, of Roosevelt & Son, told the commission that all confidence in railroad investments would be destroyed if the commission fails to allow the railroads a general increase in freight rates. Mr. Dick appeared as chairman of the Security Holders' Committee on the Railroad Emergency and presented an analysis of the situation as to railroad bonds held by savings banks and insurance companies which he said showed that many of them have "collapsed" more than German government bonds have in the past few weeks. In contrast with this he showed increases in the price of public utility bonds, which he said showed that investors are seeking "safe" bonds and that the "flight of capital from the railroads into these safe securities is comparable with the flight of capital from Germany today."

Pointing out that he had tried to persuade the commission in the western rate advance case five years ago that a higher level of freight rates was necessary to allow the roads a sufficient margin above their expenses, Mr. Dick said that "if you will not raise rates at the right time you will have to raise them in times of depression" and that it is "sheer nonsense to say that the country can't support its railroads.

"Look at all the money that is going into automobiles, concrete roads and hot dog stands."

Mr. Dick presented an analysis of the bonds and earning situation of the 67 largest railroads, those that in 1929 earned gross $10,000,000 a year or more, showing that on the basis of their earnings for the first part of this year only 21 will earn their fixed charges one and a half times, as required to make them legal investments for savings banks. Only 35 of these roads are now on the legal list and he showed that of these 20 will fail this year to comply with the requirement, leaving only 15 on the list. In reply to a question from Commissioner Lewis he said that the law does not require the sale of bonds already bought that fall below the legal requirement.

Mr. Dick said the present "collapse of railroad credit" is clearly indicated by the market values and income yields of existing bond issues comparable in character to those through which new money would have to be raised. These are the refunding and overlying bond issues. Underlying first mortgage bonds are not a significant index because, save in exceptional cases, those are now closed issues and can no longer be used to raise new capital.

"From the high point in 1930 to June 1, 1931, the average decline in the value of the refunding and overlying bonds of these railroads with annual revenues in excess of $10,000,000 was 17.6 points. In the same period German government bonds showed a decline of 17 points. So on June 1 the flight of capital from Germany was exactly comparable by this measure to the flight of capital from our railroads. I think that with the exception of a very few companies it is impossible today for any of the railroads to raise new money through normal channels."

Freight Rates and Commodity Prices

The wisdom of an effort to increase freight charges at this time in view of the general reduction in commodity prices was questioned by Commissioner Eastman, who pointed out that the average receipts of the railroads per ton-mile had increased from 7.19 mills in 1916 to 10.77 mills in 1930, an increase of 50 per cent, and that a further increase of 15 per cent would make the average rate 72 per cent higher than in 1916, whereas the commodity price index has declined from 125 to 107 up to April, 1931. "Do you think it would be economically sound or wise for the railroads to put their charges upon such a high basis compared with commodities generally?" he asked Mr. Dick.

"I don't see how they can help it," replied Mr. Dick. "If the railroads could be run as a private business it would be different but in many ways they are prevented from reducing expenses when traffic falls off."

Commissioner Eastman again referred to the "propaganda" of the railroads and financial institutions, asking if the witness knew of any meeting of bankers or other financial leaders prior to the meeting of the railway executives on May 8 at which they decided to seek an increase in rates. Mr. Dick said he knew of no such meeting. When he said that Milton H. Harrison, president of the National Association of Owners of Railroad and Public Utility Securities, had been "very active", Commissioner Eastman asked: "Are the Van Sweringen brothers still financing that organization and Mr. Harrison?"

"I never knew they were," replied Mr. Dick. The important thing, he said, was to restore the confidence of the investors that the government intended to sustain the roads. He admitted that the proposed increase would leave comparatively little for increased operating expenses if saved for net to improve the credit of the railroads unless traffic increases. Asked whether he thought the roads ought to embark upon a program of expenditure in view of their surplus capacity, he said they should where such expenditures would enable them to "junk" old equipment to reduce expenses or give better service.

Cleveland Chamber of Commerce Urges Rate Increase

Andrew H. Brown, assistant transportation commissioner of the Cleveland Chamber of Commerce, said "it may well be that the railroads are in a no worse situation than industry in general, and, if this be true, there is apparent ground for holding that they should not receive special consideration. However, railroads are engaged in a business which, by reason of its entirely essential nature, is impressed with a public interest," he said. "Such businesses are legally entitled to earn for their owners a reasonable return and only a reasonable return. They are not of a nature which permits them to secure great profits in times of prosperity, and we hold that they should therefore be less subject to the adverse influences of bad times. A 15 per cent increase in freight rates would certainly not offset the losses which would result from a breakdown of rail transportation."

Lake Lines and Short Lines Favor Increase

W. R. Evans, comptroller of the Great LakesTransit Corporation, said that the lake lines had filed with the commission a petition in support of the railroads' request for higher rates and that their own financial condition was such as to require additional revenue. Ben B. Cain, vice-president of the American Short Line Railroad Association, said he had been authorized by 153 short lines to support the railroad application but that he felt it would be superfluous to introduce any additional testimony supplementing that of the Class I railroads.

W. C. Widdell, of the Tennessee Products Corporation, testified that in his opinion inadequate transportation would prove far more costly than an increase in rates. C. E. Hochstetler, traffic director of the Chicago Association of Commerce, outlined a resolution adopted by its executive committee on July 17, supporting a "reasonable increase in freight rates," if in the judgement of the commission, such increase will, in fact, result in increased railroad revenue, but suggesting the necessity for a readjustment later and also that serious consideration should be given to a proper revision of railway wages. Donald Moore, traffic manager of the Pittsburgh Chamber of Commerce, testified regarding a resolution adopted by the general traffic committee of that organization favoring the rate advance proposal on the ground that "the additional revenues provided from an advance in rates will be returned to the channels of trade and industry by the railroads through the increase in purchases of material and supplies, and wages to additional employees now idle."

Argument on Time of Hearing

Mr. Clark, representing the insurance and savings bank committee, tried on several occasions to have the commission limit the time being taken by witnesses, saying that they were "talking the case to death" and at that rate it would take a year or so to reach a conclusion. When he announced his intention to ask that the hearings be continued Commissioner Meyer said that time would be allowed for argument on that question and that although the commission had announced

its program in the light of the best information then obtainable, it had been following the proceeding with a view to revising its plans if necessary.

During the argument Commissioners Brainerd, Mahaffie and Porter also sat with the other commissioners. Mr. Clark said that while he recognized that the law requires a "full hearing" that should be proportioned to the emergency and that the commission should control the time just as the Supreme Court controls the time for arguments before it. If it cannot do this, he said "government regulation of railroads has broken down and this commission is impotent." He said he was authorized to speak also for the committee representing security holders and therefore represented "half the railroad bond market" and "fifty million people" who have their investments in savings banks, insurance companies or trust funds. "The failure of the railroads would be the failure of the money of half the people of the United States," he said. "There are certain decisions in this life in which time is the essence," he said, "and if you decide too late the fact that you decide right may be quite unimportant."

Roads Not Asking Government for Help

Mr. Bikle said the railroads had been disappointed at the time allowed by the commission but that they would be satisfied with a short adjournment. They have no desire, he said to interpose any interference with the presentation of any material facts, but he suggested that certain specified days be allotted to certain commodities. He also took occasion to reply to some remarks made by Commissioner Eastman, saying that the railroads "are not asking the government to help them but are asking the government not to interfere with what we think we ought to do." Arguments in opposition to any change in the commission's program were made by C. E. Elmquist, J. Van Norman, J. H. Henderson, commerce counsel of the state of Iowa, J. F. Finerty and R. C. Fulbright.

New Valuation Data Based on Current Prices

Commissioner Lewis on July 21 put into the record as an exhibit a new set of valuation studies which he referred to as "underlying studies" prepared by the Bureau of Valuation stating costs of reproduction at 1931 prices and "period prices" representing an unstated period of years. He said it "should be distinctly understood that the commission has not made a valuation of the carriers", and that the figures introduced last week did not represent a valuation, but were an adjustment of the tentative or final valuations compared with the "net book value." Commissioner Meyer also said he had been surprised to read in the newspapers that the commission had issued a valuation and had wondered what it referred to. The compilation introduced showed an aggregate cost of reproduction new, for all classes of roads, of $28,056,475,952, at period prices, and a cost of reproduction less depreciation of $22,269,536,110. At 1931 spot prices the figures were $27,189,657,479 for cost of reproduction new and $21,581,016,255 less depreciation. The original cost to date of all property, except land, owned and used by steam roads as of December 31, 1929, was reported as $22,092,107,618 and the net increase in road and equipment in 1930 as $597,211,445. The original cost to date, except land, reduced in proportion to depreciation, was given as $17,539,110,027. Working capital, including materials and supplies used, was reported as $503,161,000 for 1930. An estimate of the value of lands and rights used as of the end of 1930 was reported as $3,778,248,076, while the present value as of primary valuation dates, of lands and rights, was placed at $2,883,415,465.

Although the commissioners were careful to state that the commission has not made a valuation of the railroads, if the figures given in the studies made by the Bureau of Valuation are combined according to the "formula" which valuation people are confident they can find in the various recapture valuation reports, one variation of which is to be seen in the commission's own report on the Richmond, Fredericksburg & Potomac, they produce a total between $25,000,000,000 and $26,000,000,000, which, incidentally, is not far from the total property investment figure which has been used in computing the rate of return each month. Class I roads, whose earnings reports are published monthly, that total is $26,535,000,000 at the end of 1930. In the tentative recapture reports the final values are based on an average of the estimated original cost and cost of reproduction, less depreciation and plus land and working capital, with some other slight adjustments, but in the R., F. & P. case the commission apparently gave only 25 per cent weight to original cost and 75 per cent to cost of reproduction. On this basis, using the $22,092,000,000 for original cost as of 1929, plus net additional investment in 1926, and the $28,056,000,000 cost of reproduction new at 1930 period prices, deducting 21 per cent for depreciation and adding $503,161,000 for working capital and $3,778,000,000 for lands, makes a total of over $25,000,000,000 in round numbers.

Reductions in Maintenance Expense

When Dr. Parmelee was presenting statistics showing that maintenance expenditures in the first five months of this year had been reduced 21 per cent below those for the corresponding period of 1930, following a decrease in 1930 of 16.2 per cent as compared with 1929, Commissioner Meyer asked if this represented any greater fluctuation than had been shown in the past and he expressed a curiosity to see a table showing such fluctuations over a period of years. Dr. Parmelee later submitted such a table for the years since 1890, showing that in 11 years there had been decreases in maintenance expenditures as compared with the year before, the year 1921 being the only one to show a greater percentage reduction, 23.3 per cent, than that for 1931. That year was one of depression and followed an increase in 1920 of 31 per cent over 1919. The next largest decrease was that of 16.2 per cent in 1894. All other years had shown increases as compared with the year before, amounting to 54.6 per cent in 1918, when the roads were in the hands of the government, while 18.4 per cent was the largest increase shown for any year under private management.

New Program for Hearings

The commission, on Thursday morning, announced a new program for hearings in the rate advance case which will considerably speed up and condense them as compared with the plan originally announced. Hearings will begin again at Washington on August 10 instead of 31, and additional hearings beginning August 17 will be held in San Francisco, Portland, New England, Kansas City, Dallas, Salt Lake City, Atlanta and Chicago, the latter to begin on August 31. Oral argument will be held about 10 days after the close of the hearings. The commission says evidence should be presented as concisely as possible, and that requests for time already received exceed practicable limits.

Western Livestock Rates Revised

(*Continued from page 128*)

traffic. In announcing its conclusions the commission said:

Agriculture, one of our great basic industries, is probably unique in that it can not set the price at which its product is sold with relation to the cost of production. The price it receives for its product is fixed largely by forces outside its control. Probably not until the industry is so reorganized by effectively controlling production that it acquires the same bargaining power in selling as those who buy its product will the problem of eliminating recurrent financial depressions be permanently solved. While it is the purpose of the Hoch-Smith resolution to assist depressed industry to the full extent that minimum reasonable rate levels and properly distributed transportation burdens can do so, it was not the intent of the Congress that any commodity, even though it be one produced by an industry suffering a financial depression, should be transported by the carriers at less than reasonable rates. A just and reasonable rate level is one that is justly and fairly related to other just and reasonable rates and that covers the cost of rendering the service and includes some profit to the carrier in the aggregate. The extent of that profit is generally determined by the well-known rule of "what the traffic will bear," which is largely controlled by the nature of the commodity and the distance it must move to find a market. Livestock, as we have elsewhere indicated in this report, is a commodity which from its nature can not be expected to do more than "pay its own way"; that is, it can not sustain a rate level which will produce more than the cost of rendering the service plus a minimum of profit. Judged even by these standards, livestock in portions of the western district is not at present bearing its fair share of the transportation burden; and under the rate levels herein found reasonable it will do no more than meet these minimum requirements. Indeed there is room for doubt whether the rates found reasonable will, on sheep and hogs, single deck, and, for the longer hauls of sheep and hogs, double deck, and cattle, say above 1,000 miles, produce more than a small margin above the actual cost of transportation. The importance of the freight charge to the shipper increases in proportion as its relation to the value of the load increases; hence in making rates for the longer distances or on the single-deck shipments the question of what the traffic will bear and continue to move freely may properly tend to a narrowing of the margin of profit.

"While the general need of carriers for revenue does not of itself justify proposed increased rates on a particular commodity," the commission also said, "it is relevant evidence when presented in connection with evidence to establish that the particular rates are lower than the carriers ought in justice to be required to maintain, the more so when the particular commodity constitutes an important source of the carriers' revenue." It was shown that the ton-mile revenue on livestock on 27 western railroad systems has not increased in proportion to the ton-mile revenue on other carload traffic. Consideration was also given to the net operating income of the western roads in relation to the commission's tentative valuations for 1927 and earlier years and the commission said:

"While we are not unmindful of the fact that carriers in the western trunk-line territory, taken as a whole, have not earned the fair return contemplated by section 15a, we have not found the proposed increases warranted upon the record in this investigation, but have prescribed a level of livestock rates considered to be reasonable in the light of all existing circumstances and conditions."

Commissioner Eastman, concurring in part, said that the rates prescribed, judged from the standpoint of cost of service, are in general relatively lower than the rates prescribed in the grain case and are not maximum reasonable rates. However, he said, the evidence justifies the conclusion that they will yield some return to the carriers and under all the circumstances are rates which the commission has authority to prescribe. In his judgment, however, the line has been drawn "a little too fine" and he would be more liberal to the carriers by using three rate scales, the basic scale for the principal livestock territory, a scale of 5 per cent higher for the remaining portion of western trunk line territory and the Southwest, and a 10 per cent higher scale for Mountain-Pacific territory.

Commissioner Lewis said it was "extremely unfortunate that the readjustment of livestock rates in an area covering more than two-thirds of the United States comes at a time when both the livestock industry and the carriers by railroad are in such an unsettled and unsatisfactory condition." If rather heavy increases result in some localities, he said, "they are attributable to rates which, under various influences, have been on very low levels or that are preferential as compared with other sections." However, he said that the principal scale applies rates only 10 per cent higher than prevails in Central Freight Association territory, "only a fractional part of the difference that exists in class rates."

Commissioner Mahaffie dissented, saying that the majority had erred in disregarding differences in traffic and transportation conditions in the vast territory considered.

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Work Equipment Materials at the Union Pacific System Maintenance of Way Repair Shop and Reclamation Plant

First Aid To The Injured; American Railroad Practice*

A succinct account of the standards adopted by the Medical and Surgical Section, A. R. A.

By Dr. Edward V. Milholland

Medical and Surgical Director of the Baltimore & Ohio

CONSIDERATION of first aid to the injured as applied by laymen should first of all recognize that comparatively little training is necessary. Experience has taught that a knowledge of fundamentals, with brief periods of demonstration and practical application are sufficient. It is wholly superfluous to burden the mind of the first aid worker with much detail regarding the structure of the human body and its functions. The essential thing is to give the simplest training in the application of bandages and dressings.

There are three principal emergencies that demand prompt and intelligent care and these call for the utmost emphasis. They are control of hemorrhage, the practice of artificial respiration, and the care of shock, including surgical shock, heat exhaustion and sunstroke. I do not minimize the importance of the first aid worker knowing something about the nature of wound infection and the method of preventing it, the application of temporary splints to broken bones, and the safe transportation of the injured, but it is far more important that he should know how to act promptly and intelligently in the three instances which mean the immediate saving of life.

Emergency Kits

An abundance or variety of dressings in a first aid kit usually has the tendency of encouraging the first aid exponent to pass beyond the border of layman effort. Only in places remote from the possibility of reasonably prompt surgical attendance should there be occasion for other than the simplest dressings. Probably all industrial plants are within ready access to a surgeon and an extensive variety of first aid material is not essential. Certainly on the railroads it has been found that elaborate supplies are not required, and the tendency has been to very much simplify the whole matter.

Following exhaustive study, the Medical and Surgical Section of the American Railway Association decided that the essential factor in the safe and efficient administration of first aid by laymen is the adoption of a very simple first aid kit. First aid to the injured by laymen should ordinarily be merely preliminary care, pending placing the injured person under the care of a surgeon. The Section's recommendation for intensive training of selected employees in the fundamentals, gives particular emphasis to this point.

The first aid packet adopted by this Association as a minimum requirement is as follows: The container, a cardboard box, 5 in. long by 3½ in. wide by 1 in. deep; tuck top, with thumb space for opening, and sealed bottom, made from .022 white clay coated, double manila lined stock, with directions for use printed on one side of the box, and the contents on the other side. This box contains simply eight aseptic gauze compresses or pads, four for large wounds and four for small wounds. Each compress, after having been subjected to 15 lb. steam pressure for 20 minutes and allowed to dry out in the sterilizer, is placed in a glassine envelope, which is further enclosed in a sealed manila envelope, appropriately marked for use in either large or small wounds. This action of the association follows a long period of misconception of requirements and innumerable unfortunate results from misdirected first aid by laymen.

These compresses are all that is needed to care for open wounds, and control hemorrhage; for bandages to tie on temporary splints, and means of providing a tourniquet, when necessary, and in fact provision for the proper care of practically any emergency. In places where large numbers of men are employed, additional dressings are provided by increasing the number of packets. This is a much better procedure than to have a more elaborate unit. No antiseptic for open wounds has been included in the packet. If a patient with an open wound is placed under the care of a physician within one to two hours after the injury has been sustained, antiseptic measures provided after he has reached the surgeon are efficient in preventing infection. Indeed, the compresses are all that is essential for effective first aid in general railroad operation. There is, of course, no objection to the introduction of a few special articles which the chief surgeon of an individual road may deem necessary to provide for contingencies peculiar to the territory traversed.

First Aid Squads

Practically all railroads maintain first aid rooms in charge of a physician or nurse, in the larger shops; and in smaller shops due provision is made for the administration of first aid by specially trained employees. On the Baltimore & Ohio first aid squads of five or six employees are organized in all of the smaller shops. These squads are made up of men specially selected for their intelligence, earnestness, sympathetic attitude and willingness to cooperate. They are recruited from among those who have been in the service for some years and this method minimizes the occasion for changes in the personnel of the corps. They are given very careful instruction by the medical examiners who keep in close contact with each group and supervise its work and its personnel. A record of the members of

* Dr. Milholland is chairman of the Medical and Surgical Section of the American Railway Association. Standard practice in first aid to the injured, on American railroads, as prescribed in the regulations adopted by the American Railway Association on July 31, 1925 (confirming the action of the Medical and Surgical Section) is based on quite definite rules limiting the training of employees to the essentials, and carefully excluding some features which are to be found in other codes or rules.

each group is maintained in the office of the director at Baltimore, and changes are immediately reported.

These men are taught the fundamentals of first aid and adequate demonstration of methods is given. They are impressed with the importance of knowing what first aid to the injured really means, and its limitations. They are taught that their province is first or preliminary aid to the injured and that ordinarily they are expected simply to make the patient as comfortable as possible until he is placed under the care of the surgeon. They are impressed with the importance of surgical cleanliness and are given adequate instruction regarding the nature of wound infection and the method of preventing it. They are cautioned to avoid measures that may embarrass the surgeon in his final care of the case.

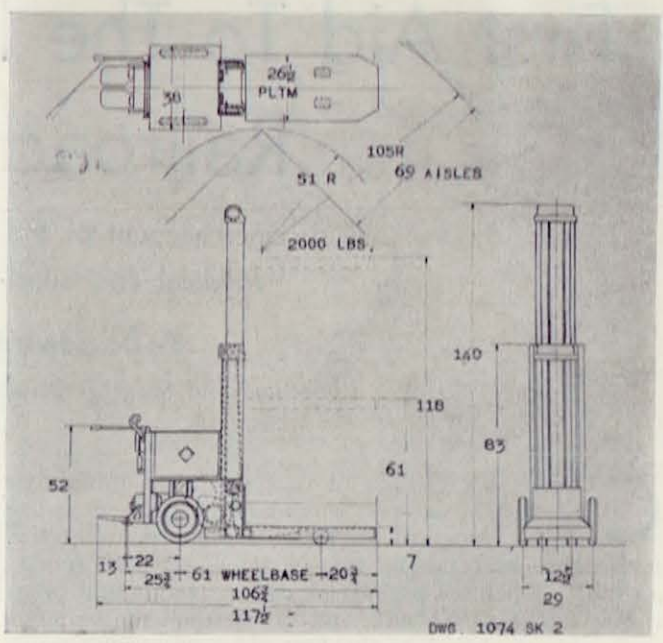
They are made acquainted with the proper procedure in the preliminary care of cases of fractured bones and the safe transportation of the injured, together with adequate instruction in the care of minor conditions; but above all, they are given intensive training in the immediate life-saving emergencies, viz: the arrest of hemorrhage, care of shock, and artificial respiration by the Shafer prone pressure method.

It should be remembered that the railroads maintain well organized surgical staffs on a very satisfactory scale for all accidental injuries to employees and also to passengers on trains when needed. The surgeons are located along the lines within convenient access to any point and invariably respond promptly and with ample facilities to take care of any situation.

Elwell-Parker High-Lift Truck

THE Elwell-Parker Electric Company, Cleveland, Ohio, has recently brought out a high-lift tiering electric truck with telescoping uprights. It is designed for placing loads in tiers or stacks and for loading or unloading cars from rail level, loading or unloading motor trucks from street level, icing cars, etc.

The electric truck illustrated is 3 ft. 2 in. wide, 9 ft. 4 in. long with a 26-in. by 54-in. platform that tiers in the open to a height of 10 ft. yet will pick up its load of 4,000 lb. at 7 in. above the floor in a railroad car with 83 in. inside height. It is designed with primary and secondary uprights, the latter of which does not begin to rise until the platform reaches a height of 61 in. This

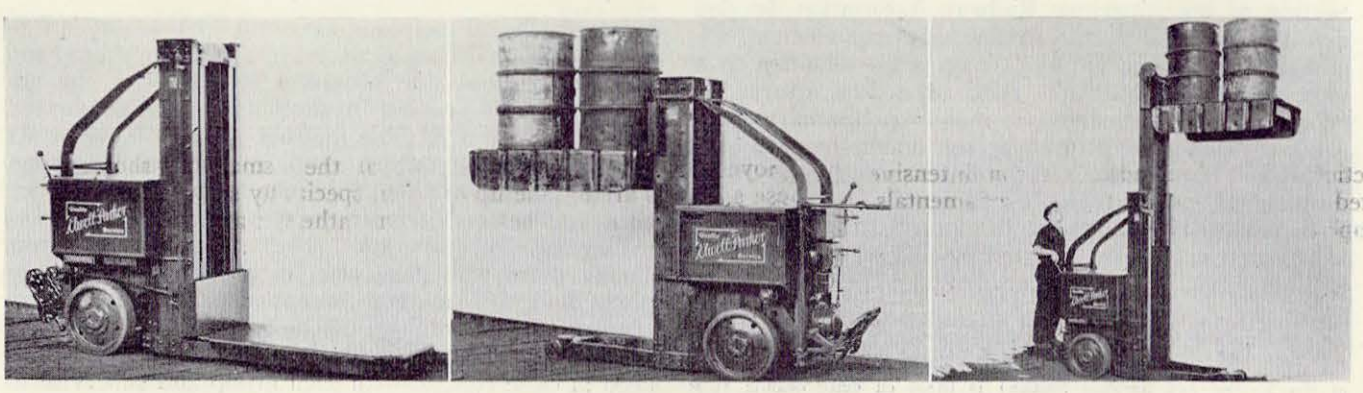


Drawing Showing the Dimensions and Operating Limits of the Elwell-Parker High-Lift Truck

feature enables the truck to stack merchandise to the roof of a box car. The truck is capable of elevating a load to a height of 118 in., but with the uprights in a lower position, it may be driven through a 7 ft. door 42 in. wide. Independent control of brake and power for ramp performance is employed. The travel, hoist and tilting or auxiliary loading and unloading attachments are all driven by fuseless motors.

The truck steers on all four rubber-tired wheels and is designed to operate in 70-in. aisles. It is equipped with standard automatic safety control of travel and hoist motors, and with cable lift, automatic elevating, hoist limit, cutouts, and either Edison or Exide batteries or Ready Power gas-electric equipment. The truck is built in sizes of 3,000, 4,000 or 6,000 lb. capacity and with platforms 7 in. or 11 in. high.

THE NEW STOCK YARDS of the Pennsylvania at Philadelphia have been put in service, superseding the old plant which for many years has occupied the site now being cleared for the construction of the new passenger station. The new stock yards, at Thirty-sixth street at Gray's Ferry avenue on the east bank of the Schuylkill River, about one mile south of the old location, adjoin extensive abattoirs and constitute an entirely enclosed plant, the floors being of tile or concrete and all pens and passageways being roofed over.



The Elwell-Parker High-Lift Tiering Truck of 4,000-lb. Capacity Designed with Telescoping Uprights for Elevating Its Load to a Height of 118 in.

Motor Transport Section

Freight Traffic Shows Steady Increase

Pacific Motor Transport Company, S. P. subsidiary, recovering business from competitive truck lines—How the company operates

By L. B. Young
Vice-President and Manager, Pacific Motor Transport Company

THE Pacific Motor Transport Company is the organization through which store-door pick-up and delivery service is provided on the lines of Southern Pacific and the Pacific Electric in California and Oregon. Its operations have been variously described in trade magazines from time to time, but constant inquiry from railroads all over the country seems to suggest a continuing interest that justifies a review at this time. Accordingly, the purpose now is briefly to describe its history, organization and method of operation; and to give, after two years of operation, a general account of the results that are being obtained.

The Pacific Motor Transport Company originated upon the lines of the Pacific Electric in March, 1929; and its purpose was to meet the competition of highway motor trucks. The Pacific Electric is an interurban passenger and freight carrying road, 600 miles long, radiating throughout Southern California in all directions from Los Angeles, and serving together with scores of lesser communities, 55 cities and towns of sufficient size and importance to justify the maintaining of freight agency stations. Into this great consuming territory, vast quantities of staple commodities and general merchandise are distributed daily from metropolitan Los Angeles. The Pacific Electric's problem was the same as that of practically every other railroad in the country: At one time, virtually all of this traffic had been hauled by the railroad; but with the advent of efficient motor equipment and extensive net works of concrete highways, a large part of it had been lost to motor trucks.

The result of this diversion of traffic was that the Pacific Electric, to say nothing of having lost a very lucrative business, was left with freight stations and facilities which were used to only a part of their potential capacity. In many cases, station forces, though already at a minimum below which no further reduction could be made, still could absorb without any additional expense, several times the volume of l.c.l. tonnage then being handled. The same was true of freight cars and freight trains.

Two Sources of Relief

From a situation of this kind there were two possible sources of relief. The first was for the railroad itself to put trucks upon the highways and divert to that mode of transportation what little l.c.l. freight it had left, thereby making possible the discontinuance of entire merchandise trains and effecting considerable savings in operating expenses. This, however, was not a practicable solution for the Pacific Electric, because, with its limited number of freight trains, none could be discontinued. The alternative was for the railroad to recover from truck competitors a sufficient share of the traffic that had been lost to them to provide a full load for its partly-used rail facilities and forces. It is this latter plan that was adopted.

Traffic had been attracted away from the railroad and to the trucks by two prime factors:

1—Trucks offered complete service from store-door to store-door.

2—Truck rates from store-door to store-door were lower than the combination of depot-to-depot rail rates, plus drayage.

The Pacific Electric believed that a fair share of this traffic could be diverted from the trucks back to the railroad by a co-ordinated rail-truck service that would offer these same two attractions. For that purpose, the Pacific Motor Transport Company was organized.

Operations upon the Pacific Electric commenced in March, 1929. Subsequently, operations were extended to the lines of the Southern Pacific and to two independent short-line connections of the Southern Pacific. The Transport Company, although entirely independently operated, belongs, through stock ownership, to the Pacific Electric, which latter, in turn, belongs to the Southern Pacific.

Method of Operation

In its form and organization, the Pacific Motor Transport Company is an express company, the same as the Railway Express Agency is. Physically, its operation is identical with that of the Railway Express Agency with two exceptions:

1—The Transport Company operates on freight trains instead of passenger trains; and

2—The Transport Company does not have messengers on trains.

And this method of operation, incidentally, is not greatly different from the method employed by motor truck carriers. The customary method of hauling l.c.l. freight by truck is generally this: At a major point of origin, such as Los Angeles, small trucks ranging in capacity usually from one ton to three tons, operate

throughout the day picking up freight at the warehouses of various shippers and hauling it to the freight depot of the truck carriers. For this pick-up work, some truck carriers own and operate their own trucks; others contract to have the work done by organized operators of pick-up service. At the truck carriers' depots, the day's accumulation of freight is set up on the freight platform, and there loaded into large trucks and trailers for the line haul. Delivery is accomplished by two methods. At smaller intermediate points, shipments largely are peddled to consignees directly by line-haul trucks; but at larger terminals, they are unloaded from the line haul trucks, set up in the freight house, and again loaded into small trucks for delivery to consignees.

The Pacific Motor Transport Company operates in exactly the same manner, with these two exceptions:

1—Instead of using large trucks and trailers for the line haul, it uses rail cars.

2—Being a rail car, instead of a highway truck, the line haul vehicle, of course, does no peddling directly to consignees' doors; all freight, even at smaller points, is transferred through the freight depot to small trucks for delivery.

The Transport Company's use of rail cars for its line haul has created in the minds of many who have written to inquire about the service, some very obvious confusion as to the part the railroad plays in the operation. To get a clear picture of the operation, these points should be borne in mind: So far as the public is concerned, the railroad does not enter into the Transport Company's operations at all. The fact that the Transport Company elects to hire a railroad to make its line haul, instead of using trucks for that purpose, is of no interest to the patron. The Transport Company, a common carrier express company, holds itself out to perform a complete service from store-door to store-door; it issues bills of lading and publishes rates to cover this entire service. The railroad is not a party to these rates; it gets its compensation, not from the shipping public, but from the Transport Company, under a private contract, just as it does from the Railway Express Agency.

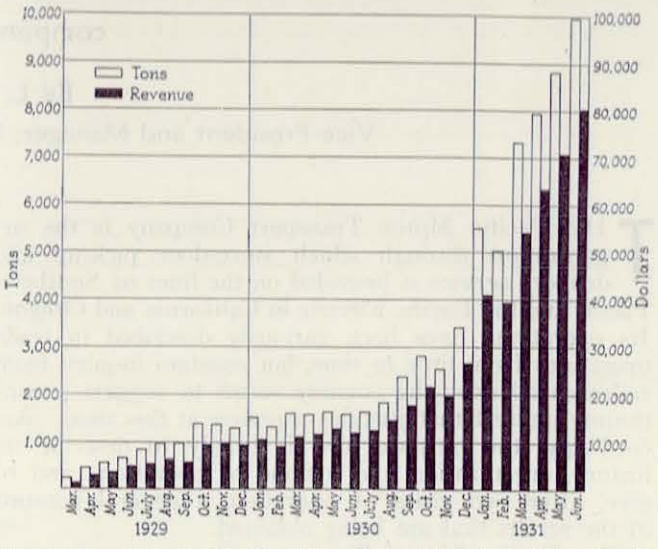
In fact, the contract between the Transport Company and the railroads follows generally along the terms of, and is largely taken from, the Uniform Express Contract. Generally it gives to the Transport Company the same rights on freight trains as the Express Agency has on passenger trains. It permits the joint use by the Transport Company of railroad stations and employees upon equitable terms; requires the railroad to transport from station to station the traffic of the Transport Company; and provides that after the Transport Company has paid, out of its gross receipts, all of its expenses, consisting principally of the costs of pick-up and delivery service, station handling, overhead, etc., and has set aside a reasonable return for itself, all of the remainder goes to the railroads in compensation for line-haul service.

No Investment Required

One of the most serious factors with which a railroad is confronted, when going into the trucking business, is the enormous investment in motor equipment usually involved in the change over from the old to the new, or co-ordinated, mode of transportation. To the Pacific Motor Transport Company this has not been a problem. One of the chief merits of its plan of operation is that it makes use of properties—motor trucks, rail cars, freight stations—that already are owned or available, but only partly used.

No investment whatever, except for office furniture, has been required in the Transport Company's express operations. The local draymen in various towns found themselves confronted, just as the railroad was, with partly-used equipment because of the diminishing volume of rail-hauled l.c.l. freight to be delivered. In every town served by the Transport Company, it succeeded in contracting with these draymen, at reasonable rates, for pick-up and delivery service. Thus, the entire service—pick-up, line haul and delivery—can be accomplished, not by making new investments, but by making greater use of old investments.

It should be noted here that while pick-up and delivery service by contract with local draymen is entirely practicable and satisfactory, and in small communities it is the only economical plan, there are circumstances, quite immaterial to this review, under which it is cheaper and altogether more satisfactory for the carrier to provide this service with its own equipment. This is more likely to be so in a large city. The Pacific Motor Transport Company is now doing its own pick-up and delivery work at Los Angeles and at Santa Barbara, but that is a subject for separate discussion.



Steady Increases in Traffic Have Been Experienced by Pacific Motor Transport Company

Expansion of the Operation

The operation, as explained, was designed primarily for the Pacific Electric, and service was inaugurated on the lines of that road in March, 1929. By September of the same year, it had been reasonably demonstrated that the new service was recovering traffic from the trucks, and the Transport Company was invited to try the service out on the lines of the Southern Pacific. Accordingly, on October 1, 1929, service was established on that road between Los Angeles and Santa Barbara, a residential town one hundred miles north of Los Angeles. The success of this operation was almost immediate; and within 30 days the Transport Company was hauling an average of 30,000 lb. of l.c.l. merchandise a day to Santa Barbara. All of it was new business which theretofore had been moving by truck; and the earnings averaged as high as 80 cents a car-mile after paying pick-up and delivery costs.

From that time onward, there were constant demands for extensions of the service. In April, 1930, operations were established out of San Francisco into the Sacramento and San Joaquin valleys, and down the coast toward Los Angeles. The Imperial Valley in Southern California was taken in; service was established in Oregon; and two short highway truck operations were established to serve isolated points where train service was inadequate. Several other railroads, watching the

expansion of the Transport Company's activities, asked for extensions onto their lines, and service was established on two short-line connections of the Southern Pacific; and plans are pending for extension to other roads.

Originally, truck competition was found to be most severe within relatively short distances, and when service was established from a distributing center, such as Los Angeles or San Francisco, it was unnecessary to go beyond the 150-mile or 200-mile area within which the highway trucks were giving daily, overnight service. But progress in the automotive sciences was so rapid during the period of development of the Pacific Motor Transport Company that truck competition now is common up to 500 or 600 miles. Accordingly, through service of the Transport Company recently has been extended not merely locally around San Francisco and Los Angeles, but clear through from one end of the state to the other; and service to even more extended boundaries, apparently will be necessary to meet the competition of constantly-expanding motor truck operations.

There still is much competitive territory into which Transport Company service has not yet been extended, but extensions are constantly being made; and from the very modest start within the restricted area around Los Angeles, operations have expanded until now they are in effect on the lines of the Southern Pacific, the Pacific Electric, the McCloud River and the Santa Maria Valley, and from Portland, Ore., on the North to the Mexican border on the South. The Oregon operation is local within that state, as no interstate service is in effect.

Carload Traffic Also Recovered

When truck competition first began to be felt by the railroads, largely it was l.c.l. or package freight that was affected. But that by no means is the situation now. The great bulk of the freight that is moving on the highways today is essentially carload in its character; and while the early efforts of the Transport Company were toward the recovery of l.c.l. traffic, just recently it has enjoyed some measure of success in meeting the more serious problem of protecting carload business.

Typical of this is the cotton which moves between certain points in California. For several seasons this crop has moved by motor truck. During the season just passing, the Transport Company recovered a very substantial portion of this crop at rates which returned about 35 cents a car-mile after paying all expenses peculiar to the Transport Company's type of operation. The Transport Company has been similarly successful in securing a gratifying volume of fresh fruit and vegetables that formerly had moved by truck.

The recovery of this traffic, it is interesting to note, results from the Transport Company's ability, through its independent operation, to provide the same flexible service that is offered by the trucks, but which may not properly be a part of the major business of railroad operation. The Transport Company's rates on fruit and vegetables, for example, include pick-up in the field within ten miles of the railroad, and distribution of empty crates in the field. Also, where rail service is slow compared with that of highway trucks, the Transport Company's rates include movement in cars containing, at the Transport Company's expense, sufficient ice to bring the load into market in as good condition as it would be if it moved by truck in one-half or one-quarter of the elapsed time taken by rail.

Service, however, is by no means the only factor contributing to successful competition with the trucks. The rate structure is equally controlling. To get the business, it is necessary to make rates corresponding relatively to "carload" rates, on quantities far smaller than a railroad will usually accept as a carload. For example, truck rates frequently are made on a minimum of 8,000 lb. or 10,000 lb. per shipment. The reason why a railroad would not be likely to make a "carload" rate on so low a minimum is apparent. Railroad carload rates usually contemplate the switching of the car to the load. The low revenue that would accrue on so small a shipment as 8,000 or 10,000 lb. would not justify the use of a 40,000-lb.-capacity car for one shipment; and to attempt to fill the car, at low carload rates, with four 10,000-lb. shipments, switching it to four different consignees on four different industry tracks, might be looked upon as involving so much delay and expense as to be prohibitive. However, the motor truck operator is not so handicapped; and neither is the Pacific Motor Transport Company. The Transport Company's rates include pick-up and delivery; and since this pick-up and delivery is made by motor truck, and the shipment is loaded from the truck into a rail car, it makes no real difference to the Transport Company whether 40,000 lb. is secured from one shipper, or 10,000 lb. from each of four shippers. In either event the Transport Company will do the loading; and if only one 10,000-lb. shipment is offered, there likely is room for it in the regular merchandise car. If two or three shipments are offered, the use of an extra car is justified.

Thus, the Transport Company is in a position to make its rates on the same low minimum weights that are observed by truck operators.

Peculiarities of the Operation

To meet truck competition with service equal to that of the competitors is essential, and in trying to provide such service the Transport Company has found it necessary to make some wide departures from the orthodox practices that appear to be traditional in railroad operation. Principal among these is late afternoon acceptance of shipments. The trucks, as an added attraction to their service, have offered later and later pick-up service, while the railroads in most cases have continued their long-standing practice of closing freight houses at 4 or 4:30 or 5 p.m. The outcome of this practice has been that many shippers have fallen into the routine of putting up first all orders that are to go forward by rail, and not starting work on orders for truck shipment until all of the rail traffic is out of the way. As a result, when the Transport Company started competing for the truck business, the first problem with which it was confronted was late pick-up, and the situation had to be met. There are many shippers who will not permit a pick-up truck to back into their warehouse until 5 p.m., and in many instances freight is received until 6 or 6:30 p.m.

Delivery immediately upon arrival at destination is equally important. The Transport Company uses a combination waybill and express bill of such character that all billing is done at point of origin instead of at destination. The chief merit of this plan is that it eliminates delay at destination while expense bills are being prepared. Immediately on arrival at destination, shipments are ready for delivery, and in most cases trucks are on the street making deliveries before 7 a.m., even though it may be necessary, in many instances, to leave merchandise before stores are open and without securing signatures. This is a common practice of truck carriers, and in meeting it the Transport Company has suffered no losses.

(Continued on page 148)

Million Dollars Saved by Motor Coach Substitution

Large reductions in operating expenses accomplished by replacement of train service with bus service on Boston & Maine

MOTOR coaches operated in substitution for passenger trains have saved the Boston & Maine approximately $1,000,000 since 1925. On December 31, 1930, the total net savings amounted to $916,657.44, and since the annual savings are running currently at the rate of approximately $200,000 a year, it is conservative to estimate that by now the net saving has passed the million mark. These net savings represent the difference in cost of the train service taken off and the motor coach service established in substitution.

The Boston & Maine is now operating 20 motor coach lines which have replaced train service. These routes have been established at various times since May, 1925, and the aggregate number of train-miles saved since then by the substitute highway routes was 852,392 at the end of 1930. Discontinuance of this train service enabled a reduction in operating expenses on the Boston & Maine of $1,495,702.65 in the five and one-half year period. The aggregate cost of the motor coach service substituted by the Boston & Maine Transportation Company, a subsidiary of the railway, was $581,211.20 at the close of 1930, which, subtracted from the train operating costs saved, leaves the aggregate net saving of more than $916,000.

The Boston & Maine, consisting of 1,273 miles of main lines and 774 miles of branch lines, all in a relatively compact territory, was among the first railways to feel the effects of highway competition. The Boston & Maine was also the first railway in the East, and the second in the United States, to substitute motor coaches for unremunerative trains.

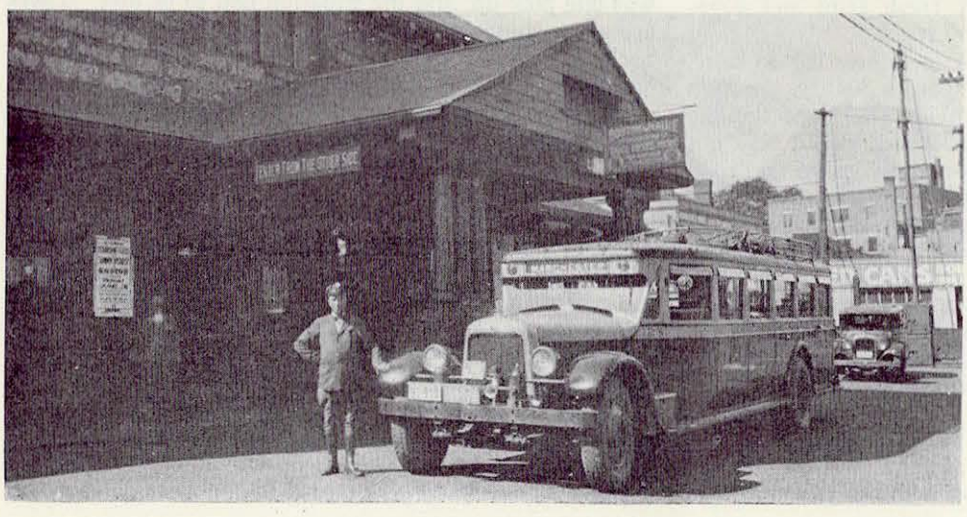
Three Alternatives

Faced with the problem of diminishing short-haul passenger traffic, the railway had to decide whether to continue to operate an expensive service at a loss, to abandon the service, or to provide a substitute service in a more economical manner. The management concluded that the first alternative would exert too heavy a burden upon the railway, while the second would work a distinct hardship upon the communities directly affected. Consequently, it adopted the third alternative, that of providing a substitute service, as the most practicable one.

Having decided to substitute a new service for unprofitable trains, the question then arose as to which new vehicle to utilize, the rail motor car or the motor coach. This soon resolved itself into a question of relative costs and of the capacity of each vehicle to handle the traffic offered.

Studies of the comparative costs of operating passenger trains, rail motor cars, and motor coaches, which were made by the Boston & Maine, showed that on the average, in Boston & Maine territory, a motor coach can be operated for one-fifth of the out-of-pocket cost of operating a train, and that a rail motor car can be operated for two-fifths of the cost of operating a train. The out-of-pocket cost of train operation was computed at $1.589 per mile. The cost of the rail motor car, on the same basis, was found to be $0.72 a mile, and the total cost of operating a motor coach on the highway, $0.289 per mile.

At the present time the Boston & Maine is operating rail motor cars where the traffic to be handled is of such volume, or where road conditions and other considerations are such as to make rail motor car operation necessary from the standpoint of performing service and desirable from the standpoint of economy. At the same time, it is operating motor coach service where the available traffic is within the capacity of a bus and where the utmost economy is required.



A Boston & Maine Motor Coach at the Lowell, Mass., Railway Station

One of the Buses Which Has Helped the B. & M. to Save a Million Dollars in Operating Expenses

The savings accomplished on individual lines by the substitution of motor coaches for passenger trains are shown in the accompanying tabulation. It will be noted that the largest individual item is the net saving from the operation of motor coaches in place of electric trains on the Portsmouth Electric Railway. This substitution was the first effected by the Boston & Maine Transportation Company for its parent railway, the motor coaches replacing electric railway service which served Portsmouth, N. H., Rye, and a part of Northampton. This operation had shown an average annual deficit of $20,000 in the previous eight years. During 1926, the first year following the motor bus substitution, the deficit of the bus operation on the Portsmouth line was $3,018.04, or $16,981.96 less than the average annual loss sustained during the last few years of operation of the electric railway service. Since May, 1925, elimination of this electric rail service has saved $616,551.92. The estimated cost of the substitute bus service aggregated $218,362.80 by the close of 1930, providing a net saving on this one line of $398,189.12.

Service Increased

Later in 1925, motor coaches were substituted for trains on the York Harbor & Beach branch, on the Concord-Newport line, and on the Bristol branch. The net savings on these lines have ranged from $7,695.25 in the case of the Concord-Newport operation, to $32,799.51 in the case of the Y. H. & B. substitution, and $66,115.37 in the case of the Bristol branch substitution. The Bristol branch offers a typical case. This single track, 13-mile line served the New Hampshire towns of Bristol and Hill, connecting with the main line at Franklin. Prior to September, 1925, when the motor bus service was started, two passenger trains were operated in each direction daily, except Sunday, over the Bristol branch at a cost of $1.17 per mile, which included no charge for interest, overhead or maintenance of way. The revenue of these trains averaged 51 cents per mile. Three round-trip motor bus schedules were substituted for the two round-trip train schedules. Incidentally, it is the general policy of the railway to increase the frequency of the service offered when buses are substituted for trains.

The York Harbor & Beach substitution was somewhat different. This is a 12-mile branch, connecting with the main line at Portsmouth, N. H. The cost of train service was $1.46 per mile, a relatively high unit figure because of mixed train operation. There is little traffic on this line during winter months, but in summer the business is heavy, particularly at week ends. At the present time the transportation company is operating seven round trips daily, except Sunday, over this line between Portsmouth and Biddeford, with additional service between Portsmouth and York Beach. About the same frequency of service is provided on Sundays.

Train Service Improved

During 1926, motor coach substitutions for trains were carried out between Concord and East Side, Nashua and Lowell, Nashua, Milford and Wilton, Northampton and Greenfield and on the Easthampton and Ashburnham branches. The motor coach route between Lowell and Nashua replaced a main-line service, enabling the turning of a main-line train at Lowell, 14 miles short of its former destination. The net saving

(*Continued on page 148*)

Saving From Bus Substitution for Rail Service, from Effective Date to Dec. 31, 1930

	Effective Date	Estimated Cost Savings: Train Miles	Estimated Cost Savings: Cost	Unit Cost per Train Mile (Cts.)	B. & M. T. Co. Cost of Substitution	Saving
Y. H. & B. Branch	6-27-25	89,892	$122,363.67	146.1	$89,564.16	$32,799.51
Concord—Newport	8-12-25	38,874	39,990.57	102.9	32,295.32	7,695.25
Boston—Fitchburg	4-29-28	34,459	27,333.35	79.3	.....	27,333.35
Bristol Branch	9-27-25	108,455	127,603.82	117.7	61,488.45	66,115.37
Concord—East Side	3- 1-26	5,069	4,792.32	94.5	Est. 4,792.32	.....
Nashua U. S.—City Station	1-23-28	1,820	1,851.75	101.7	.....	1,851.75
Nashua—Lowell	3-15-26	32,549	30,564.27	93.9	Est. 9,550.70	21,013.57
Nashua, Milford—Wilton	4-25-26	81,798	83,024.30	101.5	" 25,281.00	57,743.30
Nashua—Worchester	4-29-28	63,302	54,440.54	86.0	4,349.07	50,091.47
Northampton—Greenfield	7-19-26	53,027	34,198.11	64.5	Est. 15,939.90	18,258.21
Manchester—Lawrence	12-26-27	60,060	44,421.00	73.9	" 18,412.00	26,009.00
Easthampton Branch	8- 7-26	41,473	84,864.26	204.6	20,949.61	63,914.65
Ayer-Lowell	9-25-27	34,476	16,923.66	49.1	Est. 10,360.40	6,563.26
Winchendon—Peterboro	4-25-27	51,906	81,084.82	156.2	12,215.06	68,869.76
Troy—North Adams	4-29-28	13,226	5,942.75	44.9		
" — " "	9-29-29	1,344	1,005.31	74.8	10,714.65	14,164.83
" — " "	4-28-29	46,332	17,931.42	38.7		
Ashburnham Branch	8-23-26	35,326	59,825.99	165.9	11,485.34	48,340.65
Plymouth—Lincoln	11-10-27	42,716	24,647.13	57.7	26,813.12	.....
Bungaloo	6- 1-29	12,054	14,103.18	117.0	8,028.02	6,075.16
Whitefield—Randolph	6-29-29	4,234	2,238.51	52.9	609.28	1,629.23
Portsmouth Electric Railway	5-17-25	.....	616,551.92		Est. 218,362.80	398,189.12
TOTAL		852,392	$1,495,702.65		$581,211.20	$916,657.44

Operating Statistics of Large Steam Railways—Selected Items for the Month of May, 1931,

Region, road and year	Average miles of road operated	Locomotive-miles: Train-miles	Locomotive-miles: Principal and helper	Locomotive-miles: Light	Car-miles: Loaded (thousands)	Car-miles: Per cent loaded	Ton-miles (thousands): Gross, Excluding locomotives and tenders	Ton-miles (thousands): Net, Revenue and non-revenue	Average number of locomotives on line: Serviceable	Unserviceable	Per cent unserviceable	Stored
New England Region:												
Boston & Albany	1931 402	142,585	150,110	12,633	4,091	66.4	208,779	70,316	80	49	38.2	22
	1930 407	173,240	184,069	18,001	4,632	65.1	243,892	86,770	104	21	16.6	44
Boston & Maine	1931 2,066	316,762	367,962	38,070	11,412	67.7	598,522	218,471	214	86	28.7	36
	1930 2,066	366,480	421,342	56,259	13,069	70.0	673,122	258,537	240	50	17.3	60
N. Y., New H. & Hart.	1931 2,074	425,589	498,844	27,111	14,126	63.2	775,946	282,343	261	87	24.9	28
	1930 2,104	454,919	527,841	28,683	15,729	63.1	870,956	330,641	274	66	19.3	39
Great Lakes Region:												
Delaware & Hudson	1931 876	270,868	361,214	41,496	9,026	60.2	561,657	249,253	247	25	9.1	121
	1930 875	325,461	432,576	46,021	10,885	63.1	667,443	312,981	238	30	11.2	91
Del., Lack. & Western	1931 998	424,962	471,583	53,978	14,314	65.9	824,296	333,434	215	54	19.9	35
	1930 998	468,386	515,014	58,932	16,089	66.5	910,925	369,113	238	55	18.9	38
Erie (inc. Chi. & Erie)	1931 2,316	732,471	768,010	69,584	32,579	60.3	1,994,243	745,223	383	99	20.6	116
	1930 2,316	811,100	869,270	65,276	36,708	62.2	2,191,494	851,689	413	87	17.5	98
Grand Trunk Western	1931 1,022	249,186	252,341	3,177	7,181	60.9	420,254	146,342	115	35	23.2	37
	1930 1,020	306,092	308,944	3,200	8,899	65.1	498,444	184,625	115	35	23.5	21
Lehigh Valley	1931 1,343	456,980	485,271	49,453	14,518	62.5	891,847	367,598	222	129	36.8	33
	1930 1,343	515,507	559,486	59,767	16,321	64.8	984,939	425,590	267	76	22.1	23
Michigan Central	1931 1,869	426,756	427,351	9,996	13,919	60.4	797,692	260,256	151	64	29.7	44
	1930 1,865	476,443	477,925	13,250	16,398	59.7	942,734	313,298	167	53	24.1	38
New York Central	1931 6,477	1,683,231	1,816,043	112,934	64,172	60.4	3,923,763	1,556,223	878	533	37.8	281
	1930 6,468	1,911,631	2,092,142	140,788	74,565	61.2	4,554,202	1,896,570	1,038	325	23.8	356
New York, Chi. & St. L.	1931 1,660	482,113	493,726	4,742	16,117	60.4	933,312	320,266	168	71	29.8	48
	1930 1,665	582,489	597,685	6,506	19,178	61.4	1,096,795	390,960	201	58	22.3	45
Pere Marquette	1931 2,201	332,318	340,811	3,056	8,628	59.5	533,623	200,854	151	26	14.8	40
	1930 2,177	408,347	411,313	4,083	10,514	63.6	621,044	249,311	166	27	13.8	31
Pitts. & Lake Erie	1931 235	81,073	83,339	960	2,997	58.5	237,452	129,450	58	19	24.4	31
	1930 232	119,960	121,931	1,369	4,605	62.9	360,702	206,346	51	14	22.1	19
Wabash	1931 2,497	703,056	733,311	12,123	20,957	62.0	1,211,152	391,617	276	140	33.6	50
	1930 2,497	751,947	795,566	10,976	23,517	63.2	1,345,120	465,993	295	78	21.0	54
Central Eastern Region:												
Baltimore & Ohio	1931 5,536	1,352,776	1,573,802	164,771	43,536	60.3	2,858,569	1,216,360	927	251	21.3	315
	1930 5,541	1,702,905	1,963,689	244,667	54,884	60.8	3,702,788	1,682,259	993	195	16.4	206
Big Four Lines	1931 2,721	625,941	651,944	17,954	19,806	61.2	1,237,572	538,744	285	145	33.6	63
	1930 2,712	767,602	797,021	18,447	23,379	60.1	1,503,532	666,188	312	144	31.5	31
Central of New Jersey	1931 692	190,574	209,274	32,943	5,987	56.2	408,604	181,764	137	48	25.9	36
	1930 692	272,320	296,353	48,088	7,937	57.0	539,897	246,037	165	31	15.6	15
Chicago & Eastern Ill.	1931 939	174,434	174,635	2,229	4,327	61.8	265,103	106,686	92	65	41.5	42
	1930 946	217,803	218,167	2,869	6,193	66.2	346,327	149,453	99	51	33.9	38
Elgin, Joliet & Eastern	1931 447	100,303	102,879	3,511	2,501	60.1	193,540	96,658	77	14	15.5	19
	1930 453	127,568	136,143	5,791	3,647	63.2	279,819	142,143	74	14	16.4	2
Long Island	1931 400	43,910	46,895	11,609	551	53.1	40,592	16,160	46	6	11.9	..
	1930 400	46,293	50,975	11,649	565	52.8	39,835	15,475	41	5	11.2	1
Pennsylvania System	1931 10,669	3,252,057	3,636,944	355,938	112,395	61.5	7,339,771	3,124,709	2,243	309	12.1	805
	1930 10,689	3,690,583	4,229,870	419,343	133,400	62.2	8,904,888	4,009,344	2,427	299	11.0	654
Reading	1931 1,446	514,152	559,706	52,757	14,261	57.8	1,026,182	472,175	307	74	19.5	60
	1930 1,454	604,664	657,219	58,434	16,933	58.5	1,218,443	578,367	321	57	15.1	57
Pocahontas Region:												
Chesapeake & Ohio	1931 3,116	961,661	1,009,457	34,243	36,824	56.2	3,079,070	1,651,575	672	60	8.1	327
	1930 3,085	1,154,497	1,219,359	51,186	42,282	55.3	3,503,150	1,874,127	568	89	13.6	116
Norfolk & Western	1931 2,232	649,039	699,676	29,757	23,571	58.6	1,908,955	970,625	458	30	6.2	163
	1930 2,230	770,259	866,636	44,503	29,198	57.9	2,396,541	1,239,129	462	41	8.2	124
Southern Region:												
Atlantic Coast Line	1931 5,163	798,182	805,600	11,800	18,228	59.0	1,020,788	345,497	403	85	17.4	83
	1930 5,155	669,353	663,104	9,860	16,955	65.4	899,599	334,667	384	68	15.0	96
Central of Georgia	1931 1,900	229,695	230,623	4,870	5,222	67.7	281,985	106,819	112	37	24.6	..
	1930 1,900	258,937	259,894	4,130	6,062	66.3	334,127	132,154	123	29	18.8	6
Ill. Cent. (inc. Y. & M. V.)	1931 6,670	1,657,464	1,677,941	28,055	40,442	59.3	2,673,234	981,458	727	169	18.8	39
	1930 6,695	1,779,969	1,793,415	28,419	46,989	60.5	3,056,412	1,182,367	704	128	15.4	49
Louisville & Nashville	1931 5,263	1,291,565	1,360,863	40,635	27,572	58.5	1,855,556	814,202	536	160	23.0	115
	1930 5,242	1,542,555	1,634,113	47,366	33,936	58.0	2,328,973	1,065,940	568	127	18.3	72
Seaboard Air Line	1931 4,466	610,428	636,918	5,251	15,306	59.2	914,468	309,496	274	18	6.2	28
	1930 4,479	565,474	591,011	5,777	14,386	61.6	819,901	294,665	274	30	9.9	8
Southern	1931 6,675	1,306,061	1,325,986	28,167	31,122	62.9	1,740,986	646,987	790	177	18.3	205
	1930 6,676	1,377,002	1,407,292	27,270	33,744	62.9	1,918,979	734,086	800	155	16.2	177
Northwestern Region:												
Chi. & North Western	1931 8,459	1,135,838	1,198,978	29,335	28,620	62.5	1,695,801	601,008	699	154	18.1	165
	1930 8,459	1,291,214	1,351,619	24,761	33,461	61.4	2,029,997	752,357	751	88	10.5	128
Chi. Gt. Western	1931 1,459	232,765	232,769	18,725	7,737	61.4	458,276	169,224	111	19	14.5	12
	1930 1,459	262,060	278,480	18,755	8,309	63.3	473,663	177,904	109	12	9.8	14
Chi., Milw., St. P. & Pac.	1931 11,302	1,358,747	1,446,482	72,081	38,059	61.9	2,347,720	945,828	776	141	15.4	326
	1930 11,318	1,528,181	1,627,758	84,982	44,238	61.3	2,701,768	1,086,077	799	146	15.5	245
Chi., St. P., Minn. & Om.	1931 1,714	238,931	257,419	9,900	5,033	64.3	286,725	112,853	151	23	13.2	60
	1930 1,724	283,681	306,263	13,060	6,082	65.5	344,161	136,780	151	21	12.4	44
Great Northern	1931 8,342	603,590	610,278	18,738	20,512	69.6	1,218,448	572,868	493	136	21.6	148
	1930 8,338	760,365	772,836	30,897	27,743	66.0	1,723,010	842,909	453	151	25.1	58
Minn., St. P. & S. St. M.	1931 4,356	360,959	367,590	4,246	8,996	66.5	496,700	206,541	153	70	31.5	35
	1930 4,388	422,083	433,328	4,567	11,844	66.9	656,689	287,797	182	45	19.7	25
Northern Pacific	1931 6,451	597,395	629,031	39,447	18,758	67.9	1,073,262	445,584	389	128	24.7	80
	1930 6,472	688,117	727,044	44,591	23,025	73.7	1,245,007	566,149	409	116	22.1	59
Oreg.-Wash. R. R. & Nav.	1931 2,218	165,953	173,324	11,926	4,790	71.1	275,203	119,746	121	11	8.8	52
	1930 2,246	176,778	184,491	10,055	4,978	71.4	274,567	117,283	116	20	14.9	39
Central Western Region:												
Atch., Top. & S. Fe (incl. P. & S. F.)	1931 11,548	1,466,743	1,567,328	69,401	44,290	65.1	2,629,646	952,386	729	208	22.2	237
	1930 11,200	1,578,235	1,697,266	76,678	49,884	66.0	2,898,574	1,064,890	777	143	15.6	227
Chicago & Alton	1931 1,000	231,128	241,221	1,742	5,270	57.8	336,820	114,201	111	34	23.4	29
	1930 1,000	260,492	271,826	3,377	6,420	59.5	406,957	149,737	129	18	12.0	30
Chi., Burl. & Quincy	1931 9,270	1,147,909	1,176,504	31,894	33,851	61.4	1,986,381	861,874	504	123	17.1	87
	1930 9,275	1,280,830	1,343,141	55,048	39,176	62.4	2,284,995	1,004,070	643	145	18.4	49
Chi. Rock I. & Pacific	1931 7,593	1,133,256	1,170,030	7,233	28,029	58.4	1,756,158	644,075	496	136	21.6	129
	1930 7,593	1,300,053	1,358,257	5,154	32,728	60.0	2,010,495	761,594	536	118	18.0	97
Denver & R. G. Wn.	1931 2,536	216,253	233,694	22,105	6,026	66.1	351,377	142,601	226	21	8.3	85
	1930 2,562	234,291	266,095	36,770	6,626	66.2	393,540	169,839	205	38	15.6	54
Los Angeles & Salt Lake	1931 1,241	158,154	174,114	19,819	4,747	66.3	279,045	103,664	102	12	10.4	37
	1930 1,220	165,021	184,763	25,422	5,211	63.7	311,610	116,682	111	6	4.8	22
Oregon Short Line	1931 2,532	241,651	248,715	13,393	7,070	63.6	425,165	163,872	154	7	4.3	61
	1930 2,538	249,956	256,521	13,737	7,162	69.7	412,027	175,130	172	13	6.9	77
So. Pacific—Pacific Lines	1931 8,961	1,299,127	1,396,056	161,627	42,107	60.9	2,619,692	835,483	646	269	29.4	187
	1930 8,968	1,516,055	1,646,773	234,280	48,454	61.6	3,007,231	1,027,757	702	209	22.9	133
Union Pacific	1931 3,765	890,029	909,780	35,998	36,302	65.3	2,099,186	759,584	405	43	9.7	172
	1930 3,765	866,441	885,989	33,719	35,368	67.2	1,940,391	703,271	377	63	14.3	135
Southwestern Region:												
Gulf, Colo. & S. Fe	1931 1,965	214,277	221,992	3,617	6,205	63.2	379,073	151,275	109	16	12.5	33
	1930 1,931	214,611	224,292	4,928	7,159	66.2	438,900	189,360	106	20	15.6	24
Mo.-Kans.-Texas Lines	1931 3,176	355,308	359,351	5,136	10,325	58.1	624,323	227,721	164	56	25.6	79
	1930 3,176	365,273	370,521	7,688	11,018	58.1	679,508	260,035	173	70	28.7	80
Missouri Pacific	1931 7,423	1,188,159	1,210,770	30,075	35,707	61.2	2,219,074	816,411	525	96	15.5	207
	1930 7,424	1,393,117	1,435,445	33,613	41,306	61.5	2,561,558	1,005,074	522	82	13.5	142
St. Louis-San Francisco	1931 5,175	678,606	685,990	9,842	16,062	57.4	1,010,695	370,689	387	84	17.8	92
	1930 5,169	733,758	742,073	8,311	18,135	58.4	1,127,005	420,198	374	71	16.0	38
St. Louis Southwestern Lines	1931 1,902	253,470	263,201	3,643	7,448	57.9	452,022	138,095	109	25	18.4	28
	1930 1,805	325,769	330,694	4,672	8,025	57.3	497,543	159,339	102	26	20.3	7
Texas & New Orleans	1931 4,686	595,296	597,449	1,806	14,860	61.9	886,970	306,215	237	102	30.1	46
	1930 4,701	697,899	701,576	2,045	16,185	61.5	989,919	357,145	274	55	16.6	68
Texas & Pacific	1931 1,946	366,719	366,719	2,732	10,106	53.7	683,632	225,409	172	56	24.5	22
	1930 1,951	461,372	461,372	8,611	12,662	57.6	818,575	289,712	200	36	15.1	35

Compiled by Bureau of Statistics, Interstate Commerce Commission. Subject to revision.

Compared with May, 1930, for Roads with Annual Operating Revenues Above $25,000,000

Region, road and year	Average number of freight cars on line: Home	Foreign	Total	Per cent unserviceable	Gross ton-miles per train-hour, excluding locomotives and tenders	Gross ton-miles per train-mile, excluding locomotives and tenders	Net ton-miles per train-mile	Net ton-miles per loaded car-mile	Net ton-miles per car-day	Car-miles per car-day	Net ton-miles per mile of road per day	Pounds of coal per 1,000 gross ton-miles, including locomotives and tenders	Locomotive-miles per locomotive-day
New England Region:													
Boston & Albany	1931 3,484	3,198	6,682	10.9	22,058	1,464	493	17.2	339	29.7	5,646	159	40.7
	1930 3,894	3,725	7,619	5.3	20,309	1,408	501	18.7	367	30.2	6,876	149	52.1
Boston & Maine	1931 11,074	8,187	19,261	9.3	23,903	1,889	690	19.1	366	28.2	3,412	105	43.6
	1930 11,171	10,953	22,124	4.6	22,590	1,837	705	19.8	377	27.2	4,036	101	53.1
N. Y., New H. & Hart.	1931 19,118	12,780	31,898	15.2	25,300	1,823	663	20.0	286	22.6	4,392	106	48.9
	1930 17,133	13,944	31,077	12.4	25,273	1,915	727	21.0	343	25.9	5,068	101	52.8
Great Lakes Region:													
Delaware & Hudson	1931 10,718	4,246	14,964	3.5	27,173	2,074	920	27.6	537	32.3	9,182	121	47.8
	1930 9,909	5,082	14,991	4.6	26,693	2,051	962	28.8	673	37.1	11,535	120	57.6
Del., Lack. & Western	1931 18,704	5,061	23,765	6.7	26,668	1,940	785	23.3	453	29.5	10,776	135	63.1
	1930 18,867	6,478	25,345	4.6	25,448	1,945	788	22.9	470	30.8	11,929	125	63.1
Erie (inc. Chi. & Erie)	1931 35,115	12,983	48,098	4.3	40,441	2,723	1,017	22.9	500	36.3	10,381	97	56.1
	1930 34,874	15,821	50,695	4.2	37,182	2,702	1,050	23.2	542	37.5	11,863	102	60.3
Grand Trunk Western	1931 4,624	9,245	13,869	11.0	27,139	1,687	587	20.4	340	27.4	4,621	98	55.1
	1930 3,894	10,402	14,296	6.5	24,288	1,628	603	20.7	417	30.8	5,841	92	67.2
Lehigh Valley	1931 21,704	5,777	27,481	8.3	31,512	1,952	804	25.3	431	27.3	8,831	130	49.1
	1930 19,834	7,658	27,492	10.5	28,566	1,911	826	26.1	499	29.5	10,224	137	58.3
Michigan Central	1931 24,760	15,336	40,096	6.4	35,982	1,869	610	18.7	209	18.6	4,492	103	65.8
	1930 23,575	13,750	37,325	5.3	34,782	1,979	658	19.1	279	23.7	5,418	102	72.2
New York Central	1931 80,380	65,025	145,405	9.3	35,042	2,331	925	24.3	345	23.6	7,751	96	44.1
	1930 74,731	66,775	141,506	4.6	33,283	2,382	992	25.4	432	27.8	9,459	96	52.9
New York, Chi. & St. L.	1931 15,545	7,667	23,212	8.4	30,943	1,936	664	19.9	445	37.1	6,223	99	67.3
	1930 15,071	8,772	23,843	8.1	28,956	1,883	671	20.4	529	42.3	7,576	96	75.5
Pere Marquette	1931 11,689	4,523	16,212	3.7	25,029	1,606	604	23.3	400	28.8	2,944	91	62.6
	1930 8,428	6,951	15,379	3.4	22,475	1,521	611	23.7	523	34.7	3,694	92	69.6
Pitts. & Lake Erie	1931 19,523	4,318	23,841	8.9	38,441	2,929	1,597	43.2	175	6.9	17,768	96	35.3
	1930 15,674	6,640	22,314	6.1	39,033	3,007	1,720	44.8	298	10.6	28,690	86	61.4
Wabash	1931 20,445	8,633	29,078	7.5	33,539	1,723	557	18.7	434	37.5	5,060	108	57.8
	1930 17,884	10,670	28,534	3.1	30,705	1,789	620	19.8	527	42.1	6,021	109	69.7
Central Eastern Region:													
Baltimore & Ohio	1931 81,155	18,811	99,966	5.7	27,519	2,113	899	27.9	393	23.3	7,088	135	47.6
	1930 78,186	24,756	102,942	5.2	26,090	2,174	988	30.7	527	28.3	9,794	132	60.0
Big Four Lines	1931 24,881	20,333	45,214	6.2	32,300	1,977	861	27.2	384	23.1	6,388	109	50.3
	1930 25,635	21,917	47,552	4.5	30,251	1,959	868	28.5	452	26.4	7,925	109	57.7
Central of New Jersey	1931 16,580	7,924	24,504	13.3	26,450	2,144	954	30.4	239	14.0	8,470	142	42.3
	1930 17,112	9,859	26,971	5.4	25,255	1,983	903	31.0	294	16.7	11,465	138	56.7
Chicago & Eastern Ill.	1931 5,985	2,442	8,407	8.7	26,271	1,520	612	24.7	409	26.9	3,665	118	36.4
	1930 13,218	3,330	16,548	43.2	26,638	1,590	686	24.1	291	18.2	5,095	119	47.5
Elgin, Joliet & Eastern	1931 9,186	4,027	13,213	5.9	16,940	1,930	964	38.6	236	10.2	6,975	117	37.7
	1930 9,695	7,075	16,770	4.3	16,375	2,193	1,114	39.0	273	11.1	10,126	119	52.0
Long Island	1931 774	5,238	6,012	1.0	7,055	924	368	29.3	87	5.6	1,302	300	36.3
	1930 778	4,503	5,281	1.3	6,234	860	334	27.4	95	6.5	1,247	314	43.6
Pennsylvania System	1931 242,125	56,239	298,364	5.8	32,092	2,257	961	27.8	338	19.8	9,448	118	50.5
	1930 226,759	74,171	300,930	3.6	30,539	2,413	1,086	30.1	430	23.0	12,100	116	55.0
Reading	1931 35,922	9,688	45,610	4.1	23,948	1,996	918	33.1	334	17.5	10,531	137	51.8
	1930 32,020	11,327	43,347	5.2	23,062	2,015	957	34.2	430	21.6	12,832	132	61.0
Pocahontas Region:													
Chesapeake & Ohio	1931 50,245	9,347	59,592	2.5	44,700	3,202	1,717	44.9	894	35.5	17,096	74	46.0
	1930 42,492	11,477	53,969	2.2	40,447	3,034	1,623	44.3	1,120	45.7	19,599	79	62.4
Norfolk & Western	1931 39,266	5,536	44,802	1.0	42,703	2,941	1,495	41.2	699	28.9	14,029	109	48.2
	1930 34,204	7,296	41,500	.9	43,017	3,111	1,609	42.4	963	39.2	17,925	112	58.4
Southern Region:													
Atlantic Coast Line	1931 27,303	8,287	35,590	5.4	22,459	1,279	433	19.0	313	28.0	2,159	108	54.0
	1930 25,091	7,719	32,810	5.0	20,933	1,362	507	19.7	329	25.5	2,094	104	48.0
Central of Georgia	1931 7,503	2,201	9,704	13.6	19,928	1,228	465	20.5	355	25.6	1,814	134	51.0
	1930 6,243	2,877	9,120	8.5	19,353	1,290	510	21.8	467	32.3	2,244	128	56.0
Ill. Cent. (inc. Y. & M. V.)	1931 52,884	15,415	68,299	9.2	26,372	1,613	592	24.3	464	32.2	4,746	125	61.5
	1930 47,975	17,442	65,417	5.0	25,989	1,717	664	25.2	583	38.3	5,697	125	70.6
Louisville & Nashville	1931 52,463	9,388	61,851	11.7	21,636	1,437	630	29.5	425	24.6	4,990	138	65.0
	1930 47,444	11,903	59,347	8.5	21,788	1,510	691	31.4	579	31.8	6,560	133	78.0
Seaboard Air Line	1931 17,069	6,224	23,293	6.4	22,103	1,498	507	20.2	429	35.8	2,236	119	71.0
	1930 15,897	6,310	22,207	3.2	19,998	1,450	521	20.5	428	34.0	2,122	119	63.2
Southern	1931 55,311	11,550	66,861	13.1	20,886	1,333	495	20.8	312	23.9	3,127	146	45.2
	1930 53,737	14,616	68,353	11.8	20,820	1,394	533	21.8	346	25.3	3,547	143	48.5
Northwestern Region:													
Chi. & North Western	1931 52,975	19,587	72,562	9.0	21,210	1,493	529	21.0	267	20.3	2,292	127	46.5
	1930 49,827	22,835	72,662	7.3	21,077	1,572	583	22.5	334	24.2	2,869	122	52.9
Chi. Gt. Western	1931 4,465	3,500	7,965	7.0	32,259	1,969	727	21.9	685	51.1	3,741	119	62.6
	1930 4,284	3,929	8,213	4.8	25,825	1,807	679	21.4	699	51.5	3,933	124	79.4
Chi., Milw., St. P. & Pac.	1931 60,460	13,818	74,278	2.7	25,086	1,728	696	24.9	411	26.7	2,700	116	53.4
	1930 57,102	16,933	74,035	3.1	23,805	1,768	711	24.6	473	31.4	3,096	121	58.4
Chi., St. P., Minn. & Om.	1931 3,156	8,251	11,407	8.0	16,936	1,200	472	22.4	319	22.1	2,124	118	49.5
	1930 2,454	8,781	11,235	6.5	16,416	1,213	482	22.5	393	26.7	2,560	116	60.0
Great Northern	1931 43,663	6,624	50,287	5.9	27,846	2,019	949	27.9	367	18.9	2,215	118	32.3
	1930 42,272	7,354	49,626	5.7	29,382	2,266	1,109	30.4	548	27.3	3,261	112	42.9
Minn., St. P. & S. St. M.	1931 20,551	3,254	23,805	3.3	19,889	1,376	572	23.0	282	18.4	1,530	99	53.8
	1930 19,861	4,253	24,114	3.1	20,130	1,556	682	24.3	391	24.1	2,116	96	62.2
Northern Pacific	1931 42,055	4,530	46,585	10.4	26,442	1,797	746	23.8	309	19.1	2,228	137	41.7
	1930 41,178	5,596	46,774	8.6	25,066	1,809	823	24.6	390	21.5	2,822	141	47.4
Ore.-Wash. R.R. & Nav.	1931 8,460	2,070	10,530	6.0	24,115	1,658	722	25.0	367	20.6	1,742	133	45.2
	1930 8,152	2,676	10,828	4.7	22,609	1,553	663	23.6	349	20.8	1,685	157	46.2
Central Western Region:													
Atch., Top. & S. Fe (incl. P. & S. F.)	1931 72,386	11,465	83,851	8.3	30,240	1,793	649	21.5	366	26.2	2,660	104	56.3
	1930 71,102	15,629	86,731	6.9	29,789	1,837	675	21.3	396	28.1	3,067	107	62.2
Chicago & Alton	1931 10,767	2,627	13,394	7.3	27,119	1,457	494	21.7	275	22.0	3,685	123	54.1
	1930 10,599	4,378	14,977	5.3	25,969	1,562	575	23.3	323	23.2	4,831	122	60.4
Chi., Burl. & Quincy	1931 44,845	12,578	57,423	6.5	26,527	1,730	751	25.5	484	31.0	2,999	115	54.4
	1930 45,539	15,395	60,934	5.7	25,467	1,784	784	25.6	532	33.2	3,492	117	57.3
Chi., Rock I. & Pacific	1931 38,173	12,209	50,382	10.0	24,129	1,550	568	23.0	412	30.7	2,736	130	60.1
	1930 35,104	16,978	52,082	7.0	22,397	1,546	586	23.3	472	33.8	3,236	133	67.8
Denver & R. G. Wn.	1931 13,592	2,630	16,222	2.3	23,201	1,625	659	23.7	284	18.1	1,814	160	33.5
	1930 13,072	2,814	15,886	3.1	22,283	1,680	725	25.6	345	20.3	2,139	162	40.1
Los Angeles & Salt Lake	1931 4,727	1,130	5,857	2.5	27,398	1,764	655	21.8	571	39.4	2,696	133	55.1
	1930 4,909	1,320	6,229	1.9	26,410	1,888	707	22.4	604	42.4	3,085	139	58.1
Oregon Short Line	1931 8,005	3,114	11,119	4.6	27,419	1,759	678	23.2	475	32.2	2,088	105	52.6
	1930 7,773	3,070	10,843	5.3	25,683	1,648	701	24.5	521	30.6	2,226	109	47.3
So. Pacific—Pacific Lines	1931 42,038	23,685	65,723	6.9	30,106	2,017	643	19.8	410	33.9	3,008	110	54.9
	1930 39,898	27,804	67,702	5.1	27,717	1,984	678	21.2	490	37.5	3,697	116	66.7
Union Pacific	1931 25,754	7,249	33,003	7.8	46,508	2,359	853	20.9	742	54.3	6,508	103	68.1
	1930 24,214	7,113	31,327	8.7	42,228	2,239	812	19.9	724	54.2	6,025	102	67.3
Southwestern Region:													
Gulf, Colo. & S. Fe	1931 10,157	2,658	12,815	5.3	28,538	1,769	706	24.4	381	24.7	2,483	100	58.2
	1930 10,264	3,024	13,288	4.1	29,558	2,045	882	26.5	460	26.3	3,163	94	58.7
Mo.-Kans.-Texas Lines	1931 14,436	4,487	18,923	5.2	28,474	1,757	641	22.1	388	30.3	2,313	86	53.4
	1930 17,547	5,468	23,015	6.0	28,344	1,860	712	23.6	364	26.6	2,641	91	50.2
Missouri Pacific	1931 32,977	15,451	48,428	13.7	29,689	1,868	687	22.9	544	38.9	3,548	111	64.5
	1930 30,620	17,047	47,667	6.1	27,668	1,839	721	24.3	680	45.5	4,367	112	78.5
St. Louis-San Francisco	1931 27,179	6,425	33,604	3.0	23,152	1,489	546	23.1	356	26.9	2,311	132	47.7
	1930 25,858	7,671	33,529	3.2	21,180	1,536	573	23.2	404	29.9	2,622	138	54.4
St. Louis Southwestern Lines	1931 6,834	3,607	10,441	8.6	28,304	1,783	545	18.5	427	39.7	2,343	91	64.5
	1930 6,793	4,048	10,841	5.7	23,930	1,527	489	19.9	474	41.7	2,848	101	84.5
Texas & New Orleans	1931 12,521	14,392	26,913	6.0	22,932	1,490	514	20.6	367	28.8	2,108	91	57.1
	1930 11,907	14,169	26,076	3.9	20,912	1,418	512	22.1	442	32.6	2,451	93	69.0
Texas & Pacific	1931 6,524	6,148	12,672	8.8	28,595	1,864	615	22.3	574	47.9	3,737	93	52.3
	1930 6,066	5,569	11,635	5.7	26,022	1,774	628	22.9	803	60.9	4,790	87	64.3

Freight Traffic Shows Steady Increase

(Continued from page 143)

In meeting truck competition, it also has been necessary to provide a C.O.D. service, and to give credit on freight charges ranging from two or three days to a month. There have been practically no losses from this practice.

Lenient packing requirements also are a prime factor in meeting the service offered by truck carriers. With one or two exceptions, the Transport Company uses, not the Consolidated Classification, but a special classification designed for and used by a great many of the truck carriers in the territory served. The simplicity of its descriptions, and its flexibility as to packing and marking, permit the acceptance of many adequately prepared shipments which would be rejected under the strict rules of prohibition that might be found in other classifications.

The foregoing are typical of a great many departures from practices that may have been followed by railroads in the past. Mostly they are practices which the truck operators have educated the shippers to expect.

Operating Results

The total volume of business being done by the Pacific Motor Transport Company, by comparison with the total that has been lost to the trucks, is not large. But it constantly is growing, month after month, and the preponderance of it is business that has been recovered from the trucks. Having in mind, on the other hand, that the operation has nowhere near reached the peak of its development, what already has been accomplished suggests satisfactory results for the future.

For example, excluding the car-load farm products referred to in the foregoing, the Transport Company is forwarding from distributing centers about 300 tons of merchandise a day. A careful check shows that at least 80 per cent of this traffic would be moving by highway truck if the Pacific Motor Transport Company service were not available.

The railroads calculate that the hauling of the Transport Company's l.c.l. traffic is costing them very little over and above what their costs were before they had the added traffic of the Transport Company to handle. Traffic of the Transport Company is carried in most instances, in the same box cars as the regular railroad merchandise, and with very few exceptions there has been room in these cars, because of the railroad's losses to the trucks, for all of the Transport Company's traffic, with the result that but little extra car mileage has been required. On the Pacific Electric, for example, the average load per merchandise car forwarded from Los Angeles, prior to the advent of the Transport Company, was 11.1 tons. Now it is 20.6 tons, an increase of about 85 per cent.

Also, with one or two exceptions, and exclusive of major terminals, station forces have been able to absorb the handling of all of the Transport Company's tonnage without any increase in expense.

Until very recently through service for long distances at relatively higher rates was not provided. Now that such service has been established, the Transport Company's earnings per ton are, of course, expected materially to increase. At present, however, the average gross earnings are $8.70 per ton. The average cost of pick-up and delivery service is $1.15 a ton for each service, or a total of $2.30 for both. This leaves, after paying for the service peculiar to the Transport Company's operation that is, pick-up and delivery $6.40 a ton. When it is considered that this largely is "added traffic" which otherwise would move by truck, and that its handling by rail requires no additional trains, but few additional car miles and very little added station expense, the earning of $6.40 a ton seems to compare quite favorably with what a railroad, in this territory, might expect to earn from purely local l.c.l. traffic of the same length of haul.

The lenient packing requirements of the Transport Company's classification do not appear to result in excessive loss or damage. The average charge to this account is less than one-half of one per cent of the gross receipts.

The accompanying graphic chart shows the rate at which the business of the Transport Company is growing. Some of the indicated increase is due to extensions of service. Mostly, however, it is, despite depressed times, due to increased business in the territory served for some time. There have been practically no extensions since December, 1930, and most of the increase has taken place since then. The progress that is being made seems to offer rather convincing evidence that traffic can be recovered from the highways by the Pacific Motor Transport Company's method of operation.

Million Dollars Saved by Motor Coach Substitution

(Continued from page 145)

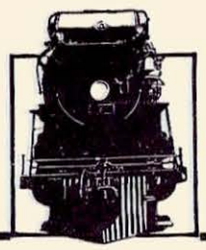
by the end of 1930 aggregated $21,013.67. In the Connecticut river valley, more service was being provided between Greenfield and Northampton than was warranted by the volume of traffic. Furthermore, too many of the through trains were making local stops. Motor coach service was substituted between Greenfield and Northampton and the local stops of some of the through trains were eliminated. The aggregate savings on this line are estimated at $18,258.21. Complete substitution of motor coach service for train service was effected on the Easthampton branch between Easthampton, Mass., and Mt. Tom. The cost of the passenger train service on this line was estimated at $2.04 per mile. Net savings on this line have been $63,914.65, representing the difference in the cost of the motor coach service furnished, $20,949.61, and the expense which would have been incurred had the train service not been eliminated.

Savings Make Buses Profitable

In 1927, motor coaches replaced trains between Manchester and Lawrence, Ayer and Lowell, Winchendon and Peterboro, and between Plymouth and Lincoln. In 1928, substitutions were effected between Boston and Fitchburg, between the city station and the union station in Nashua, between Nashua and Worcester, and between Troy and North Adams. In 1929, further substitutions were made on the Troy-North Adams line, and also between Whitefield and Randolph.

From the standpoint of transportation company revenues and expenses, the motor coaches operated by the Boston & Maine have shown a loss. For example, the net loss in 1930 was approximately $43,000. This is more than offset, however, by the operating economies which the railway has been able to effect by reason of its motor coach operations.

Odds and Ends Department Appears on Next Left Hand Page



RETURN of BUSINESS

will find a NEW Railroad

■ AS BUSINESS FELL OFF, the less economical locomotives were "white-leaded". The efficient power was used more intensively, until today a far larger proportion of the traffic than ever before is handled by relatively modern power. As a result, net returns are holding up surprisingly well.

But the whole railroad is now geared up to the performance of its best locomotives. Return the older ones to service as business improves and you will retard operations, with a disastrous effect on net income.

Get ready now. Have sufficient modern locomotives to maintain the present standard of operating efficiency as business increases.

LIMA LOCOMOTIVE WORKS
INCORPORATED

LIMA LOCOMOTIVE WORKS
Incorporated

LIMA - - - - - - OHIO

Odds and Ends . . .

Bouyant Figures

No doubt the recent balloon trip of the two German scientists has inspired the Kansas City Southern magazine columnist to figure out that for $9,500, the cost of a full page ad in the leading woman's magazine, that railroad, using its weighted average rate, will haul a ton of freight a distance equal to four times the mileage between the earth and the moon.

Degrees

North American railway presidents were among those honored with academic degrees at degree conferring time this year. L. A. Downs of the Illinois Central received the degree of Doctor of Laws from Centenary College, Shreveport, La.; Henry W. Thornton of the Canadian National received his second LL.D., from Brown University, while Daniel Willard of the Baltimore & Ohio received his sixth LL.D., this time from the University of Pennsylvania.

Over and Above

A Whitsuntide holiday escapade by two Ryde schoolboys has just come to light. The boys, aged 9 and 10, lay down in the four-foot way of the Southern Railway (Great Britain), about a mile from Ryde station, on Monday evening, and allowed an incoming passenger train to pass over them. The driver noticed the boys too late to stop as the train swung around a bend at 30 m.p.h. Pulling up afterwards, he saw them scamper away across the fields unharmed.—Railway Gazette.

Special Train Saves Life

Fast passenger trains are not always operated at break neck speed for the extra fare trade or to satisfy the whim of a private car owner. Recently a crew on the Missouri-Kansas-Texas operated a train, consisting of a locomotive and a single coach, at an average speed of slightly less than 60 miles an hour over the 80 miles between Smithville, Tex., and Temple to save the life of a nine-year old girl who was struck by an automobile on the streets of Smithville. The train was given right of way over all other trains to rush the child to the Temple hospital.

A Conscience Fund Disbursement

This matter of the conscience stricken passenger who remits the amount of an unpurchased ticket for a railway journey works both ways, the Northern Pacific has discovered. Recently a check for 27 cents, issued by A. M. Cleland, general passenger agent, now retired, and countersigned by E. E. Nelson, clerk, now passenger traffic manager, dated April 9, 1909, and payable to Curtis Whiteaker was cashed in the treasurer's office at St. Paul, Minn. It was forwarded to the treasurer's office along with regular remittances from the agent at Kalama, Wash. While the records regarding the claim are no longer in existence, it probably was issued to cover an amount paid by the railroad for an unused ticket.

Switch Key 66 Years Old

CINCINNATI, OHIO

TO THE EDITOR:

The issue of July 4 mentions a switch key on the St. Louis-San Francisco which is 47 years old. I have in my possession a switch key issued on the Big Four, or at that time the Indianapolis & Cincinnati, on July 1, 1865. This key was issued to Louis Wingert, who is now on the retired list of the Big Four and is 87 years of age. Mr. Wingert was an engineer for more than 50 years, and prior to that time a brakeman and conductor.

I am quoting part of Mr. Wingert's letter to me when he sent the switch key after his retirement:

"Now I am going to send you my switch key which I drew in July 1, 1865. Your father was present when I drew it. The man who had charge of the pit and who hired me said that if I lost the key it would cost me $5. Your father spoke up saying, 'That boy will never lose that key,' so here it is for you."

Mr. Wingert is a Civil War Veteran and, at the present time, in fairly good health.

S. V. BEVINGTON,
Superintendent, Cincinnati Terminal,
Cleveland, Cincinnati, Chicago & St. Louis.

Fiddlers Four

The "Fiddlers Four," a musical ensemble that has presented concerts in Utah, Oregon, Montana and Idaho, is composed of the daughters of four Oregon Short Line men at Pocatello, Idaho, the master mechanic of the Idaho division, an electric welder operator, a fire chief and an engineman. Recently the four daughters fiddled for the international convention of a civic organization at Miami, Fla.

When High Bridges Were New

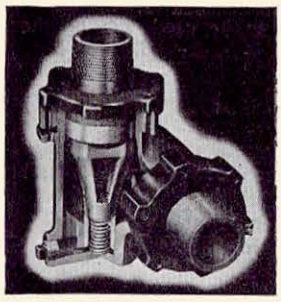
When "high" bridges were not so commonplace as they are today and the usual procedure in negotiating a precipitous river valley with a railway line was by means of a "low" crossing, the Des Moines & Northern constructed the bridge shown in the accompanying illustration over the Des Moines river at High Bridge, Iowa, in 1881. The bridge had a total length of 2,020 ft., and was 101 ft. above the water. The spans were of the combination type with wood compression and iron tension members, and the vertical posts of the trestle were clusters of four timbers while the incline posts were of two timbers. The Des Moines & Northern, which was acquired by the Chicago, Milwaukee & St. Paul in 1899 as the Des Moines, Northern & Western, was of narrow gage when the bridge was built. In 1881 the new Milwaukee line crossed the valley a few miles from High Bridge by a tortuous line down and up the valley side and over the river by a low bridge, a method also followed in the construction of the Chicago & North Western across the Des Moines river west of Boone. Later these two roads emulated the narrow gage line and constructed viaducts extending from bluff to bluff. It is interesting to note in the illustration that the man standing at the extreme left on the bridge is C. F. Loweth, chief engineer of the Milwaukee, who was assistant engineer on the construction of the bridge. At his left is Edward C. Kinney, chief engineer of the D. M. & N. J. A. L. Waddell was engineer in charge of the bridge construction.

The Des Moines & Northern Crossing of the Des Moines River

News Department Begins on Next Left Hand Page

CULTIVATE THE PASSENGER

IN THE last few years, the Pullman Company has spent many millions of dollars to supply de Luxe equipment for passenger trains. • Every luxury of the home and club is included for the comfort of the passenger. • This is considered good business. • But the entire effect of the imposing surroundings is spoiled by a single jolting start. • Nothing is more destructive of good-will than rough handling. • Yet it is easily avoided. Locomotive Boosters on your passenger locomotives give the extra power to start smoothly and without taking slack. • Booster roads command the cream of competitive passenger traffic, because they give more for the fare and therefore get more to haul. Bus competition is not so easy against Booster roads.



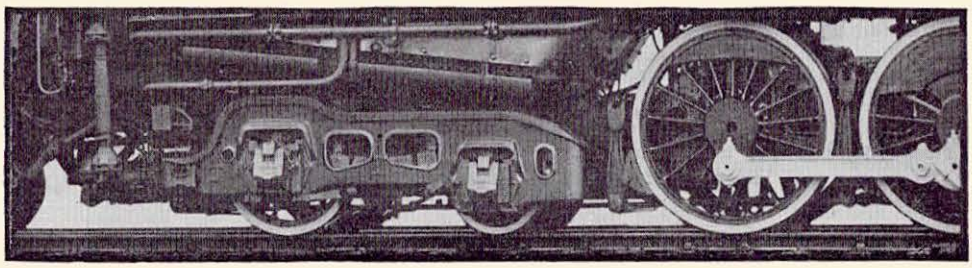
THE FRANKLIN SLEEVE JOINT

Uses flat gaskets—the cheapest to buy when replacement is necessary.

FRANKLIN RAILWAY SUPPLY CO., INC.

NEW YORK CHICAGO ST. LOUIS SAN FRANCISCO MONTREAL

THE LOCOMOTIVE BOOSTER



NEWS

P. R. R. Extends Container Service

With the inauguration this week of new freight rates for container car service, the Pennsylvania has announced that the number of points on its lines where such service is offered will be doubled and that more than 3,000 new steel containers will be placed in service to take care of shipments under the new tariff.

The railroad began experimenting with merchandise containers about three years ago. The containers are approximately seven by nine feet in size and eight feet high, with a cubical content of 440 cu. ft. Flat cars, equipped for the purpose, carry five and eight of these containers with a possible capacity carload of 25 to 40 tons. The containers are designed for the loading of small lots of merchandise not requiring the use of an entire car. Demand for additional shipping points and more equipment resulted in a recent order by the railroad for 3,250 new containers, at a cost of $1,500,000. These containers are now ready for service.

The service heretofore offered by the Pennsylvania embraced the New York metropolitan area and the principal points east of Pittsburgh, as well as Pittsburgh, Cleveland and Buffalo. Additional schedules will provide service between these points and the following cities: Akron, Ohio, Chicago, Columbus, Dayton, Detroit, East St. Louis, Indianapolis, Grand Rapids, Mich., Louisville, Ky., and Toledo.

The National Freight Company, a forwarding concern, has announced that, with the new rates, it will be unable to handle freight without carload rating between the New York Metropolitan area and the following points: Baltimore, Buffalo, Chicago, Cincinnati, Cleveland, Dayton, Toledo, Detroit, Kansas City, Milwaukee, Philadelphia, Pittsburgh and St. Louis.

All-Expense Coach Tours to Pacific Coast

The Chicago, Rock Island & Pacific, in conjunction with the Southern Pacific, will operate two all-expense coach tours from Chicago to the Pacific coast and return, on August 16 and 23. Patrons will travel by special coach trains during the day and will stop over each night at some interesting city or mountain resort. Under this plan the entire trip to California and return is made by daylight, thus allowing patrons to view points not seen during an ordinary trip across the continent. The members of each party will be assigned to rooms in high-class hotels during the night. Stops will be made at Omaha, Neb.; Colorado Springs, Colo.; Glenwood Springs, Salt Lake City, Utah; Lake Tahoe, Cal.; Reno, Nev.; San Francisco, Santa Barbara, Los Angeles, San Diego, Feather River Canyon and other points. Five full days will be spent in Los Angeles. Sightseeing trips by motor are included at the principal stops.

The cost of these tours, which will require 19 days, will be $154.15. Meals, for which coupons are issued, will be $38 additional.

Railway Employment in April

The number of railway employees as of the middle of the month of May was 1,337,328, an increase of 5,923 as compared with the number for April, according to the Interstate Commerce Commission's preliminary statement. As compared with April, 1930, this was a decrease of 15.34 per cent, and as compared with April, 1929, it was a decrease of 20.06 per cent.

Brotherhood Officers Re-Elected

David B. Robertson, Youngstown, Ohio, international president of the Brotherhood of Locomotive Firemen and Enginemen and Timothy Shea, Jersey City, N. J., assistant president, were re-elected at the thirty-second convention of the Brotherhood at Columbus, Ohio, on July 16. Albert Phillips, Roseville, Cal., was chosen by acclamation for general secretary-treasurer. The latter, formerly vice-president, has been acting secretary-treasurer since the death of Albert H. Hawley on May 28. C. V. McLaughlin was elected vice-president to succeed Mr. Phillips.

Freight Traffic in May

Freight traffic handled by the Class I railroads in May amounted to 30,014,344,000 net ton-miles, according to reports compiled by the Bureau of Railway Economics. Compared with May, 1930, this was a reduction of 6,558,984,000 net ton-miles, or 17.9 per cent, and it was a reduction of 11,831,644,000 net ton-miles, or 28.3 per cent, under May, 1929. In the Eastern district, the freight traffic was a reduction of 19.7 per cent compared with the same month in 1930, while the Southern district reported a decrease of 15 per cent. The Western district reported a reduction of 16.4 per cent.

The freight traffic handled in the first five months of 1931 amounted to 146,068,257,000 net ton-miles, a reduction of 31,759,361,000 net ton-miles, or 17.9 per cent, under the corresponding period in 1930, and a reduction of 51,700,735,000 net ton-miles, or 26.1 per cent, under the same period in 1929. Railroads in the Eastern district for the five months reported a reduction of 18 per cent, while the Southern district reported a decrease of 18.5 per cent. The Western district reported a decrease of 17.4 per cent.

B. & M.-Maine Central to Establish Air Services

An air passenger service, using trimotored, radio-equipped planes between Boston, Mass., and Portland, Rockland and Bangor, Me., will be inaugurated on August 1 by Boston-Maine Airways, Inc., aviation subsidiary of the Boston & Maine and the Maine Central, under joint agreement with the Pan American Airways Company, a subsidiary of Pan American Airways Corporation. Tickets and all passenger arrangements will be made at the railroad stations of the Boston & Maine and Maine Central, at airports and at travel bureaus. Traffic administration will be under the Boston-Maine Airways Inc., which will include services by several railroad departments, while management, equipment and air mail service will be by Pan American Airways Company.

The Boston-Maine Airways daily service between Boston, Bangor and intermediate points will be operated from August 1 to September 30 this year. While detailed schedules are still in preparation, it has been decided to operate two trips a day each way between Boston, Portland, Rockland and Bangor, with an additional round trip between Boston and Portland; while Pan American will operate three round trips weekly on a through international service to be established from Boston to Portland, Bangor, Calais, St. John, N. B., and Halifax, N. S. On plane departures co-ordinated with existing rail and air schedules, passengers may fly from Boston to Portland in 55 minutes, to Rockland in another half hour, and to Bangor in 2 hr., 25 min., airport to airport. A connecting air service will be arranged at Rockland to provide direct service to the various islands on the Maine coast in that vicinity, and automobile or other service will be available from Bangor to Bar Harbor, Northeast Harbor and vicinity.

The airports to be used will be those already established in each city, the Boston Airport at East Boston, the Portland Airport at Scarboro, the Rockland Airport and the Bangor Airport. Motor buses will provide transportation from the North Station in Boston and from Boston hotels to the airport in time for scheduled flights, while similar provisions will be made in Portland, Bangor, Calais, St. John and Halifax.

In a statement announcing the establishment of the new service, Presidents E. S. French of the Boston & Maine and Morris McDonald of the Maine Central said:

The Boston & Maine and the Maine Central for several years have considered the establish-

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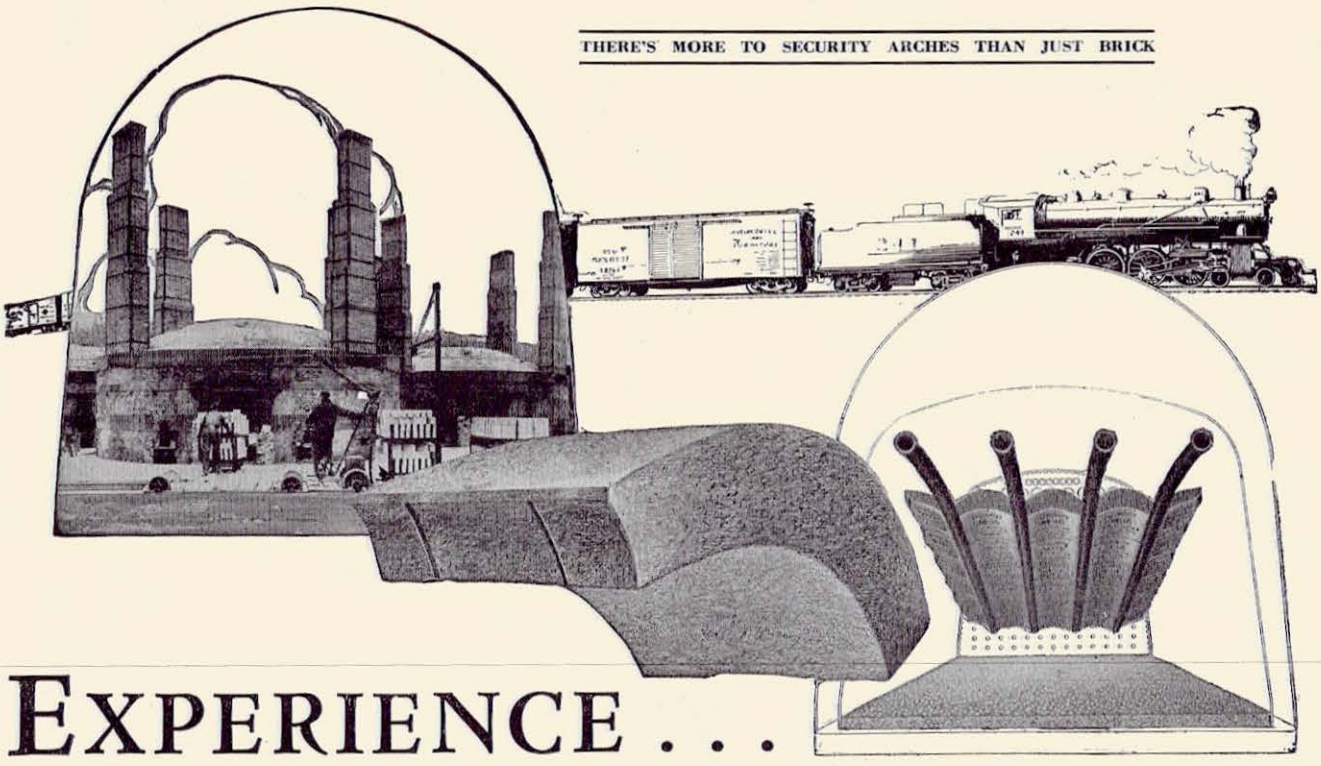
THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK



EXPERIENCE . . .

the foundation of American Arch *service*

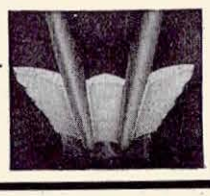
A GENERATION of railroad men have put the matter of locomotive arches up to American Arch Company.

American Arch Company has designed the Arches for the new locomotives. American Arch Company combustion experts have checked over the locomotives on their first runs; have helped organize storage systems; have developed methods that give greater mileage from Arch Brick.

Added to this has been constant, systematic research that steadily improved design and simplified brick shapes and sizes.

Those roads who have entrusted their locomotive Arches to American Arch Company are daily deriving a real dollars and cents benefit from the service given by these locomotive combustion experts.

HARBISON-WALKER REFRACTORIES CO.
Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
Locomotive Combustion Specialists

ment of an air service to points on the Maine coast to which the directness and the speed of air transport would provide elements of convenience not so readily available by train. Traffic surveys have indicated a large seasonal flow from Boston and contributary points such as New York and Philadelphia which might be increased by such speedier service.

This study became intensive several months ago with a view to establishing such a service this season. It was found that Pan American Airways was also making surveys to determine the traffic possibilities of an intensive passenger service in connection with the air mail contract which they had obtained on the Boston, Portland and Bangor section of their international route between Boston and Halifax.

The studies were joined; the railroads feeling that Pan American Airways, by its success in international air operation on large scale would bring to this proposed service in New England an invaluable experience, trained personnel, and other considerations of operating safety.

The Boston & Maine and the Maine Central believe that as transportation companies they should offer those forms of transportation desired by the public in the territory which they serve. It was determined to organize the Boston-Maine Airways, Inc., as a joint subsidiary, and to enter into an agreement by which Pan American Airways would provide the operation of the route.

There is no thought that this or any other airplane service will supplant the railroads' service by train; and the improvement in rail service will be continued.

In a similar announcement of the new service, President J. T. Trippe of the Pan American Airways System stated:

Through the co-operation of the Boston & Maine and Maine Central, through their new aviation subsidiary; of the Colonial Air Transport domestic air mail and passenger service between New York and Boston; and of Pan American Airways; there is afforded an ideal co-ordination of transport facilities which will effect important time savings throughout eastern New England and the Canadian Maritime Provinces.

The Boston-Maine Airways, Inc., will have a board of directors which includes Morris McDonald, president, Maine Central, and E. S. French, president, Boston & Maine; with P. M. Payson of Portland, Me., as its president; Laurence F. Whittemore, general representative, B. & M., vice-president; Arthur B. Nichols, vice-president, B. & M., clerk of the corporation; W. S. Trowbridge, vice-president, B. & M., treasurer, and W. O. Wright, passenger traffic manager, B. & M., general traffic manager.

C. N. R. Reduces Salaries

The Canadian National will on August 1 reduce all salaries of over $3,600 by 10 per cent for a period of ten months. The reduction will not apply to employees whose rates of pay are governed by scheduled agreements.

Reciprocity Hearings

Hearings in connection with the Interstate Commerce Commission's investigation of reciprocity in purchasing and routing will be resumed at Philadelphia, Pa., on July 29 before Director W. P. Bartel of the commission's Bureau of Service, for testimony relating to the Pennsylvania and the Reading.

More Air-Conditioned Equipment on the B. & O.

In order to meet the popular demand for air-cooled cars, the Baltimore & Ohio has added air-conditioning equipment to two more of its trains between Washington, D. C., and New York, one leaving Washington daily at 9:10 a. m., and the other leaving New York (Jersey City) at 9:30 a. m. Beginning Monday, July 20, trains No 6 and 523 will be equipped with the air-conditioned cars, consisting of smoking-lounge car, latest type parlor cars, individual seat coaches and colonial dining car.

The first air-conditioned train, which started on May 24, was the "Columbian," between Washington and New York.

Shipping Board Asks Rehearing in Fourth Section Rate Case

The Shipping Board has directed its bureau of traffic to intervene in support of petitions filed by Pacific coast steamship lines with the Interstate Commerce Commission for a rehearing in the case in which last July it authorized the railroads to reduce class and commodity rates on 149 commodities between west coast ports without making corresponding reductions at intermediate points.

Return Transportation for Drovers

Western railroads, beginning August 1, will provide return transportation for drovers accompanying one-car shipments moving 200 miles or more to receiving stations. Heretofore, drovers have been given return transportation only when accompanying two or more cars to the market. The change will be a distinct benefit to small shippers and feeders, and will be tried out for one year on an experimental basis.

Rates on Fresh Meat and Packing House Products Reduced

The Iowa Board of Railroad Commissioners, on July 18, ordered a revision of freight rates on fresh meat and packing house products for distances of from 250 to 500 miles, effective August 1. The revised schedule places the rate for 500 miles on a par with the interstate Chicago-Omaha rate, which is 36 cents. The old rate on fresh meat scaled upward from 27½ cents for 260 miles and the rate on packing house products upward from 27 cents.

Federal Barge Line Not To Operate Through Hennepin Canal

The Secretary of War has approved the recommendation of the advisory board of the Inland Waterways Corporation declining to approve at this time operations through the Hennepin canal by the Inland Waterways Corporation. The recommendation was made following a trial trip through the canal with a cargo of corn which it is stated demonstrated that at a rate of 7½ cents per hundred for grain from the Twin Cities to Pekin, Ill., operation would be at a loss. The board was of the opinion that if and when certain conditions are fulfilled, requiring additional capital expenditure on the canal to put it in shape for practical operation, it will offer the opportunity for "logical and economically sound operation."

New Through Services on Southern

The Southern, as a result of arrangements recently concluded with several of its connecting lines, has doubled the through services available daily between New York and Nashville, Tenn., and has also inaugurated through sleeping car service from Fort Worth, Tex., to Asheville, N. C.

New York-Nashville cars are now carried on trains leaving New York at 11:10 a.m. and 9:05 p.m., running via the Pennsylvania to Washington, D. C.; Southern to Lynchburg, Va.; Norfolk & Western to Bristol, Va.-Tenn.; Southern to Chattanooga, Tenn., and Nashville, Chattanooga & St. Louis to Nashville. Northbound, the new service is available on trains leaving Nashville at 2 p.m. and 10 p.m.

Fort Worth-Asheville sleepers are operated via the Texas & Pacific, Missouri Pacific and Southern, through Memphis, Tenn., and Chattanooga. Eastbound, they leave Fort Worth at 4:45 p.m. and arrive in Asheville at 10:25 a.m., and, returning, leave Asheville at 6:40 p.m. to arrive in Fort Worth at 8:40 a.m.

Court Holds Permit to Drill on Right of Way Contrary to Statute

Although the Railroad Commission of Texas has granted permits to several railroads to drill oil wells on their respective rights of way, Judge J. D. Moore of the District Court at Austin, Tex., on July 12, decided that railroads do not own their rights of way in simple fee and that they only have an easement over the land. Under this decision, the Texas & Pacific cannot drill oil or gas wells upon its right of way in the oil-producing area of Ector county, which was involved in the particular case before the court. The railroad contended that oil and gas were materials needed in the operation of the road and were, therefore, permissible to take and use. This contention was denied by Judge Moore.

Great Northern Wins Patent Infringement Suit

Efforts to collect approximately $1,000,000 from the Great Northern for an alleged patent infringement in connection with the construction of its Cascade Tunnel, were squelched by the U. S. District Court at Spokane, Wash., on July 16, when the court decided that there had been no patent infringement and that there were, therefore, no grounds for demanding damages from the railway. The Great Northern tunneled through the Cascade Mountains by means of the pioneer tunnel method, which involved the construction of a small bore parallel to the main tunnel to aid in carrying out the work. Engineers who alleged they held a patent on this method sued the railway. The railway contended that the pioneer tunnel method had been known and used before the patent was obtained, and this contention was upheld by the court.

I.C.C. Examiners Find Western Hay Rates Too Low

A general revision of freight rates on hay in the western district is recommended by Examiners A. S. Worthington and M. J. Walsh of the Interstate Commerce Commission in a proposed report in Part 10 of the rate structure investigation. Stating that hay is a commodity which from its nature can not be expected to "more than pay its way," the examiners

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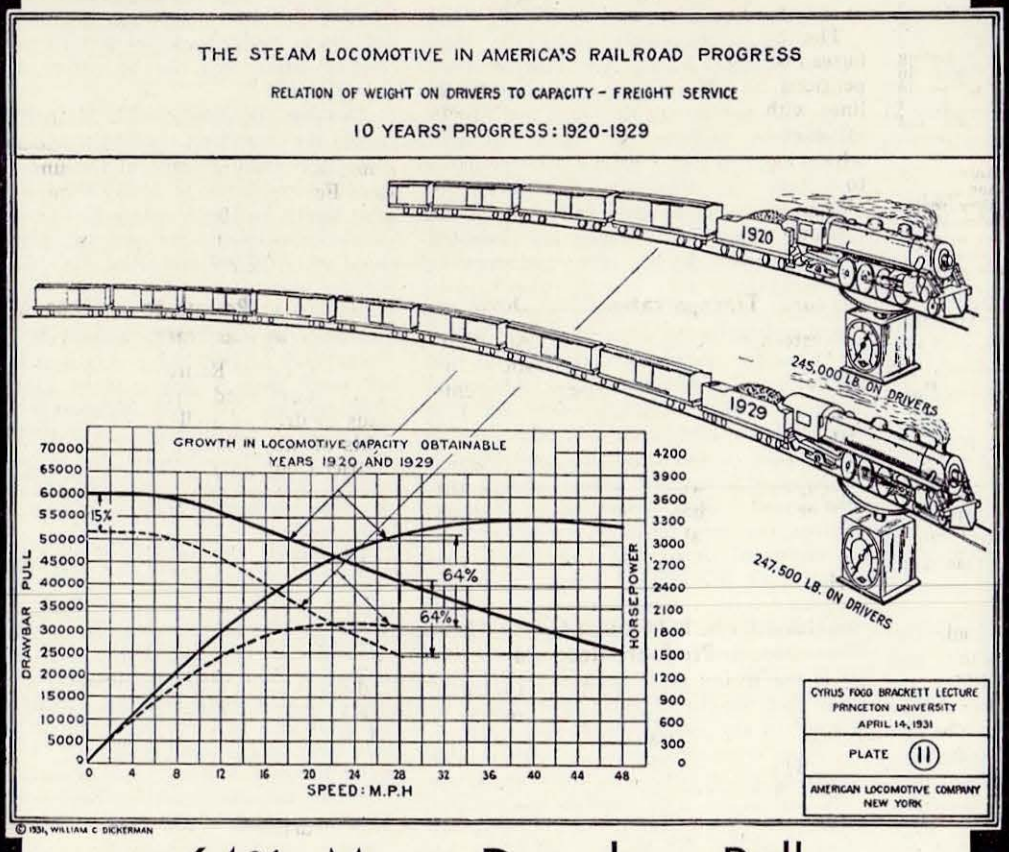
Lower Operating Costs by MODERNIZING



64% More Drawbar Pull At Fast Freight Speeds

THE modern locomotive is so much more powerful and efficient than locomotives built ten years ago that there should be no question regarding the economy of replacing older equipment by modern motive power.

Take this specific case for example. The above graph represents the actual performance of a 1920 and a 1929 locomotive on the same railroad and in the same heavy duty freight service. The 1920 locomotive, with weight on drivers of 245,000 lb., developed at starting a drawbar pull of 52,000 lb. At 28 miles per hour (*see dotted curves*) which is a good average operating speed for freight service today, the engine developed a drawbar pull of 25,000 lb. The locomotive of 1929, with only one per cent more weight on drivers, develops a drawbar pull at starting of 60,000 lb. At 28 miles per hour, however, (*see solid curves*) the 1929 locomotive develops a drawbar pull of 41,000 lb. or 64% more, at that speed, than the 1920 locomotive. And that's what counts.

This big increase in drawbar pull is the true measure of the superiority of the 1929 locomotive over that of 1920.

What is the practical application of all this? Freight schedules in heavy service, making far faster time and without reducing tonnage!

It pays to modernize. The profits now lost will pay the cost.

American Locomotive Company
30 Church Street New York N.Y.

say that, "judged even by these standards, hay in a large part of the western district is not at present bearing its fair share of the transportation burden and under the rate levels hereinafter recommended it would do no more than meet these requirements." The recommended rates are included in two mileage scales, for application in the western group and in the Mountain-Pacific group, with another scale of arbitraries for interterritorial movements. The first scale begins with 10 cents per 100 pounds for 10 miles and reaches 19 cents at 100 miles, while the second begins at 11 cents and reaches 21 cents at 100 miles. The scales, however, run up to 2,500 miles.

No Grain Via Hudson Bay This Season

That there may be no test movements of grain over the Hudson Bay Railway to Fort Churchill, on Hudson Bay this year was suggested in the House of Commons at Ottawa last week by Hon. Dr. R. J. Manion, Minister of Railways and Canals.

"The work of developing the port," he said, "is ahead of schedule, and by September 15 the elevator will be available. My officials state that the four-year construction program of the late government contemplated a test of facilities this coming autumn, and the completion of the port during the season of 1932.

"The government has fulfilled the implied obligation of its predecessors and will have the terminal facilities at Churchill available on September 15 as planned. The railway, the dock, the elevator, and the necessary aids to navigation have been provided. Vessels will not proceed to Churchill to load unless grain is sold abroad for delivery via that port. The matter is thus in the hands of the grain exporters. It is no part of the business of the government to undertake the purchase and sale of grain for movement via Churchill, any more than for movement via any other Canadian port. If the test movement is to take place, the responsibility is therefore on the grain dealers of western Canada."

Canadian Rail Committee Reports to House

Recommendations for appointment of a commission to consider the whole question of general transportation; present curtailment of Canadian National projects entailing capital expenditures; salary of Sir Henry Thornton, president of the C.N.R., to be treated as a "public document" and non-publication of the list of other salaries of paid officers are recommended in an unanimous report of the special committee of the House of Commons at Ottawa considering the Canadian National report.

The document further recommends revision of the resolution of former C.N.R. directors for $30,000 life annuity to Sir Henry Thornton on termination of services; consideration by directors of the whole question of salaries, allowances, disbursements, pensions and retirement provisions for executive officers. The abandonment of the Canadian Government Merchant Marine and the making of arrangements with other shipping companies so that external trade of Canada will not be jeopardized, is also proposed.

The report condemns a practice that it declares has grown up under which the C.N.R. is chargeable with large amounts for social entertainment and other activities of officers on other than official business.

Further recommendations include: Continuation of payments under the Maritime Freight Rates Act (under which rates in the Maritime provinces were reduced 20 per cent); thorough audit by independent auditor of system accounts from time to time; action for elimination of loss on Vancouver-Seattle-Victoria steamship service; approval of bill to authorize expenditures made and indebtedness incurred during 1931; and approval of measure to authorize the guarantee of securities to be issued under the Canadian National Railways Financial Act, 1931.

"Certain questions relating to the salaries and emoluments paid to executive officers of the company were asked by members of the committee, and were by resolution of the committee submitted to a sub-committee for consideration," said the report. "The report of the sub-committee has been received accompanied by a statement from the president of all salaries of $15,000 per annum and over, together with the names of the officials receiving them. The president, Sir Henry Thornton, has expressed the opinion that it is not in the best interests of the railway that the list of such salaries and the names of the recipients be published.

"Your committee while of opinion that many of the salaries are much too generous, and in some circumstances excessive, accede to the expressed wish of the president that the list be not published for the reasons given by him."

Reductions in Western Passenger Service

Reports showing drastic reductions in passenger train service made by the western railways to effect economy in operation were presented to the Interstate Commerce Commission on July 17 by H. A. Scandrett, president of the Chicago, Milwaukee, St. Paul & Pacific and chairman of the special committee of presidents representing the western carriers, in connection with his testimony in the rate advance case.

"In 1929," stated Mr. Scandrett, "the total passenger train-mileage between Chicago and St. Louis was 3,466,855; in 1931 passenger train mileage between these two points will be reduced to 3,131,878." Citing similar statistics of passenger train movement between other important destinations in the western district, Mr. Scandrett pointed out that passenger train-mileage between Chicago and Kansas City will total 4,473,527 in 1931 as compared with 5,147,879 in 1929; between Chicago and Omaha, 7,832,936 in 1931 as compared with 8,551,899 in 1929; and between Chicago and the Twin Cities, 6,252,257 passenger train-miles in 1931 as compared with 7,516,303 passenger train-miles in 1929.

"On these four runs just listed," Mr. Scandrett continued, "the total passenger train-mileage of the western carriers amounted to 24,682,936 in 1929. In 1930 this figure had been reduced to 24,256,713 and the corresponding figure for 1931 is estimated at 21,690,598. Under present conditions this figure will be substantially reduced again in 1932, as the elimination of certain trains occurred well after the first of the year in 1931 and the full effect of these reductions in service, on an annual basis, will not be apparent until next year."

Dealing specifically with his own railroad, Mr. Scandrett testified that the total passenger train-mileage of the Milwaukee in 1929 amounted to 16,219,840. In 1930 this figure had been reduced to 15,407,492, while he estimated the corresponding 1931 total at 12,737,967 and fixed the 1932 total on the basis of schedules now existing at 11,978,000 passenger train-miles. "It thus appears," testified Mr. Scandrett, "that from 1929 to 1930 there was a reduction of more than 5 per cent in passenger train-mileage on the Milwaukee road. Passenger train-mileage for 1931 will show a reduction of more than 21 per cent under the 1929 total, while 1932 will show a reduction below 1929 of more than 26 per cent."

Discussing the relative desirability of reductions in branch line and local passenger service as compared with reductions in through service, Mr. Scandrett pointed out that the Milwaukee is now operating four eastbound and three westbound trains daily between Chicago and Minneapolis, two trains daily each way between Chicago and Omaha and one train daily between Chicago and Kansas City. "If our passenger service between these specific points," the witness testified, "was reduced to an absolute minimum of one train daily in each direction such a drastic slashing of our through schedules would produce a saving of only 8 per cent in the total passenger train-mileage of the Milwaukee road."

In this same comparison of through service with local and branch line service Mr. Scandrett pointed out that the fleet of 13 "crack" trains operated by the Milwaukee road in the month of April, 1931, ran a total of 387,390 miles and produced gross revenues amounting to $854,148. In the same month the total passenger train-mileage of the Milwaukee road totaled 1,121,708, while the gross revenues earned by all passenger trains amounted to $1,361,802. "In other words," stated Mr. Scandrett, "these 13 through passenger trains in April, 1931, accounted for only 34.5 per cent of the total passenger train-mileage of the Milwaukee road, while they produced 62.7 per cent of the total passenger-train revenues which we received in that month."

Northern Pacific Raspberry Movement Heavy

During the three weeks ending July 18, the Northern Pacific handled 2,100 tons of raspberries, in solid train loads of refrigerator cars, from the Puyallup valley in Washington through the Twin Cities for distribution in Chicago and eastern markets.

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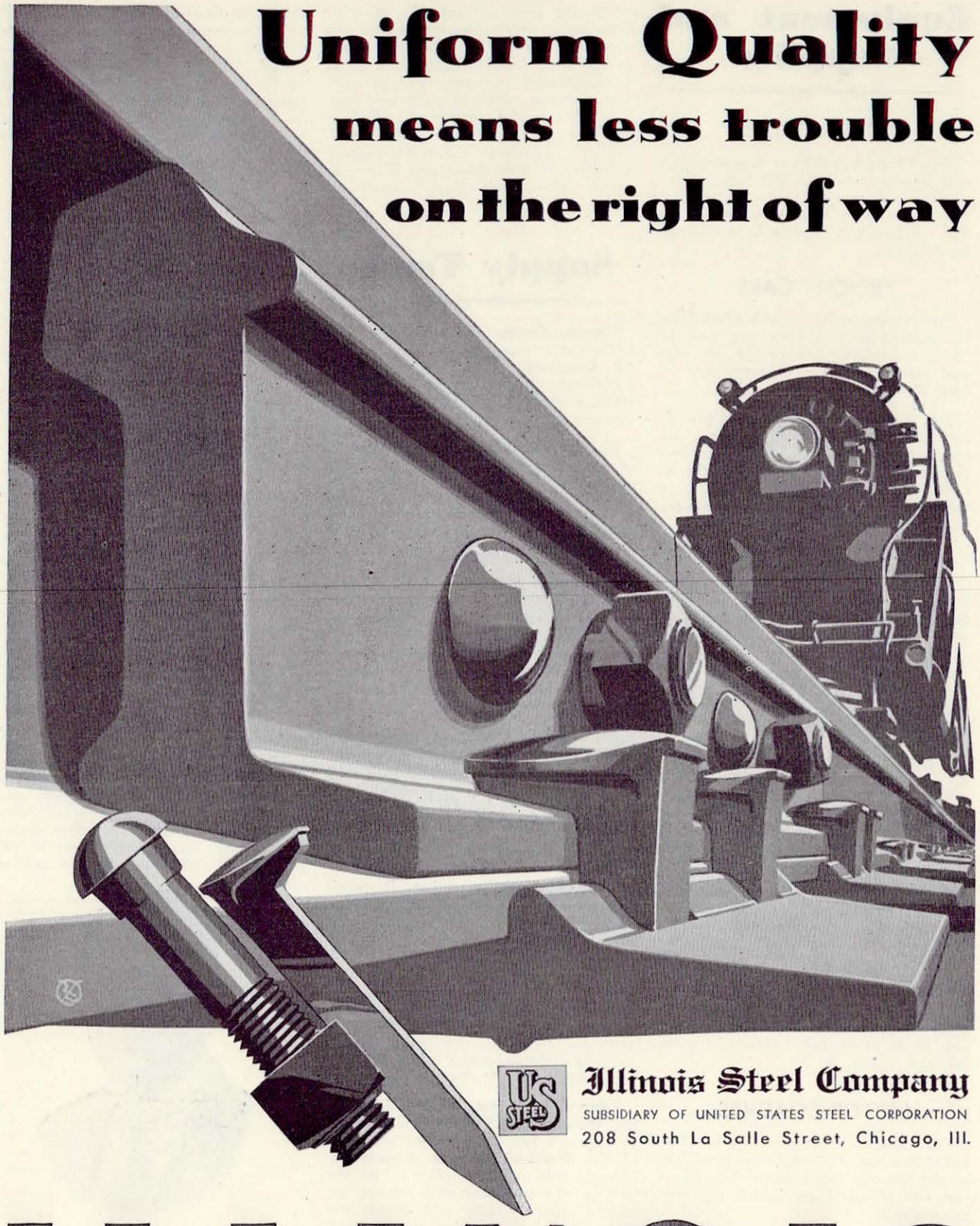
Uniform Quality means less trouble on the right of way



Illinois Steel Company
SUBSIDIARY OF UNITED STATES STEEL CORPORATION
208 South La Salle Street, Chicago, Ill.

ILLINOIS TRACK MATERIALS

Equipment and Supplies

LOCOMOTIVES

THE CHINESE NATIONAL RAILWAYS are now inquiring for ten 2-8-2 type locomotives and ten 4-6-2 type locomotives for service on the Peping Liao-ning Line. The purchasing department is at Tientsin, North China.

FREIGHT CARS

THE AMERICAN RAILROAD OF PORTO RICO has ordered 200 sugar-cane cars from the Gregg Company. Inquiry for 100 cars was reported in the *Railway Age* of June 20.

THE NEW YORK CENTRAL, to provide for its requirements of container cars and containers, has leased 225 container cars and 1,350 containers from the L. C. L. Corporation. The cars are to be built by the American Car & Foundry Company.

PASSENGER CARS

THE MISSOURI-KANSAS-TEXAS is inquiring for one baggage and mail gas-electric rail motor car.

IRON & STEEL

THE CHICAGO, BURLINGTON & QUINCY has ordered 300 tons of structural steel for miscellaneous work from the American Bridge Company.

THE LONG ISLAND is building a bridge at Wantagh, Long Island, N. Y., requiring 340 tons of steel, which has been ordered from the Fort Pitt Bridge Works.

THE MICHIGAN CENTRAL has ordered 350 tons of structural steel for grade crossing elimination work at Detroit, Mich., from the American Bridge Company.

THE LEHIGH VALLEY has ordered from the McClintic-Marshall Corporation 225 tons of steel for a bridge to be built in connection with grade crossing elimination work, at Decker Crossing, Cayuta, Schuyler county, N. Y.

MOTOR COACHES

THE READING TRANSPORTATION COMPANY, Reading, Pa., highway subsidiary of the Reading, has accepted delivery of one a.c.f. 37-passenger parlor car type motor coach.

SIGNALING

THE CHICAGO, BURLINGTON & QUINCY has ordered from the Union Switch & Signal Company materials required for the installation of an electro-pneumatic interlocking at Waterman tower, Galesburg, Ill. The order includes a 47-lever Model 14 interlocking machine for controlling 13 switch layouts with A-1 movements and style CP cut-off valves, 12 direct acting electro-pneumatic switch layouts and 35 style "H" searchlight signal mechanisms. An illuminated track model is also included, to cover the entire territory, together with the necessary rectifiers. The order further includes the necessary centralized traffic control equipment for controlling Graham interlocking, a distance of four miles from Waterman tower. This interlocking involves six switches and 11 signals.

Supply Trade

George Kirtley has been appointed general sales manager of the **H. K. Porter Company,** with headquarters at Pittsburgh, Pa., to succeed **Harvey Lefevre,** who has resigned to go into other business.

E. A. McCallum, who has been in charge of the San Francisco, Cal., office of the Stacey Engineering Company, has been transferred to the Pacific Coast headquarters of the **International-Stacey Corporation,** 410 Subway Terminal building, Los Angeles.

The Inland Steel Company, Chicago, has added steel sheet piling to its line of rolled steel products. Two sections have been placed on the market and others are to be added to the line in the near future. One of the new Inland sections is designed for heavy pressures and the other for hard driving.

The Hackmann Railway Supply Company, Chicago, has acquired all patents and manufacturing and distributing rights covering Hackmann trackliners and other devices, in addition to certain other rights formerly held by the **Hackmann Trackliner Company,** which is now succeeded by the former company.

L. A. Paddock, operating vice-president of the **American Bridge Company,** at Pittsburgh, Pa., has been elected president, with headquarters at Pittsburgh, to succeed **Joshua A. Hatfield,** deceased; and **Arthur L. Davis,** general contracting engineer at New York, who has been with the American Bridge Company in the contracting department since its formation, has been elected vice-president in charge of sales, with headquarters at Pittsburgh.

Edward J. Mehren, vice-president of the **McGraw-Hill Publishing Company,** at Chicago, has been elected president of the **Portland Cement Association,** Chicago, effective September 1. By the election of a president from outside the cement industry who will devote his entire time to the position, the Portland Cement Association departs from its former practice of selecting as its head a president of one of the cement companies. Mr. Mehren has been engaged in the business publishing field for 25 years. He was born in Chicago on August 5, 1881, and obtained his academic and technical training in engineering at St. Ignatius College and the University of Illinois. He obtained his first practical experience in 1906, as a member of the engineering corps of the Chicago, Milwaukee & St. Paul on its Puget Sound extension. In the following year he became an associate editor of Engineering Record at New York, where he remained until 1911, when he was appointed secretary and manager of the

Edward J. Mehren

Emerson Company, efficiency engineers. Mr. Mehren was appointed editor of Engineering Record in 1912, and when that publication was consolidated with the Engineering News in 1918 he became editor of the combined magazine. In 1921, he was appointed vice-president of the McGraw-Hill Publishing Company at New York, being transferred to Chicago in 1928.

George D. Bassett, vice-president of Crerar, Adams & Company, Chicago, has resigned to become manager of the railroad department of the **H. Channon Company,** Chicago, **J. L. Taylor,** vice-president in charge of railroad sales, having been assigned to other duties. Mr. Bassett was born in Batavia, Ill., on May 17, 1863. He entered railway

George D. Bassett

service as a clerk in the store department of the Chicago & North Western and on June 16, 1879, entered the employ of Crerar, Adams & Company as an office boy. In 1898, he was promoted to salesman and in 1924, to vice-president, which position he held until June 30, 1931.

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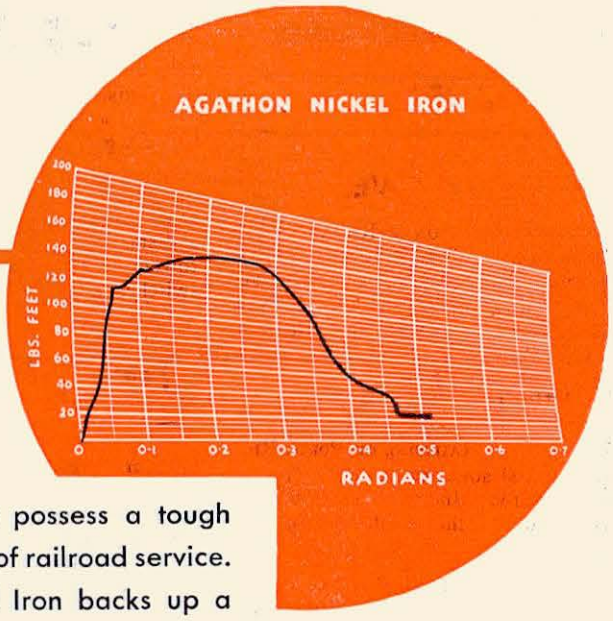
A HARD CASE

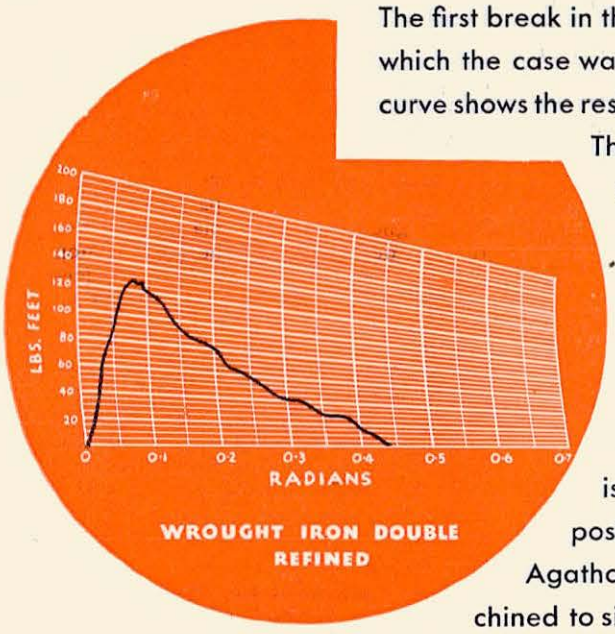
backed by a tough core



Case-hardened pins must possess a tough core to withstand the shocks of railroad service.

How well Agathon Nickel Iron backs up a hard case with a tough core is shown by these charts.

The Humphrey Machine which produced these charts, bends the full section to the breaking point of the case and then on to final rupture. The first break in the line indicates the point at which the case was first cracked; the rest of the curve shows the resistance of the core to rupture.



The core of the wrought iron shows rapidly diminishing resistance as the angle of bending increases.

Agathon Nickel Iron, on the other hand, shows stubborn resistance even after the case is broken. The core is tougher and uniform in composition.

Agathon Nickel Iron may be machined to size, polished, carburized and quenched from the pot without spoiling the surface for smoothness. Warping is practically negligible.

Try this modern alloy iron for all case-hardened pins and bushings.

AGATHON NICKEL IRON

CENTRAL ALLOY DIVISION

REPUBLIC STEEL CORPORATION

MASSILLON, OHIO

Construction

BALTIMORE & OHIO.—The Public Service Commission of Pennsylvania has ordered the elimination of a grade crossing of this company's tracks and the National pike, at the western limits of Washington, Pa. The work, which is to be completed by December 31, 1932, includes the construction of an underpass and a new connecting highway at an estimated cost of approximately $250,000, about one-half of which will be paid by the railroad.

CANADIAN PACIFIC.—A contract for the construction of a power house at Regina, Sask., has been awarded to Bird, Woodall & Simpson, Ltd., Regina, at a cost of $80,000.

CHICAGO & ILLINOIS WESTERN.—A contract for the construction of a grade separation structure to carry the tracks of this company over state highway No. 53 at Lockport, Ill., has been awarded to Joseph E. Nelson & Sons, Chicago.

CHICAGO, BURLINGTON & QUINCY-UNION PACIFIC.—Using company forces, these roads have undertaken the construction of a concrete and steel viaduct to carry Ed Creighton avenue over their tracks between Twenty-fourth street and Twenty-seventh avenue, Omaha, Neb. This structure will be 826 ft. long and will carry a 22-ft. roadway and a five-ft. sidewalk. A contract for furnishing the structural steel for the main portion of the viaduct has been awarded to the Omaha Steel Works, Omaha.

DELAWARE, LACKAWANNA & WESTERN-ERIE-DELAWARE & HUDSON.—These three companies have awarded to the Hecker-Moon Company, Cleveland, Ohio, a contract for the elimination of a grade crossing at Liberty street, Binghamton, N. Y. The separation of grades is to be accomplished by relocating the street 300 ft. east of the existing crossing, and projecting the new street under the present track level at a point about 2,600 ft. east of the D. L. & W. passenger station. The work will require approximately 425 tons of reinforcing steel, 70,000 sq. ft. of waterproofing, 2,500 ft. of drain pipe and 80,000 bags of cement.

ERIE.—A bid submitted by the American Bridge Company, New York, for furnishing and delivering structural steel and cast steel pedestals, scuppers and strainers in connection with the elimination of a grade crossing of this company's tracks with the Suffern-Hillburn state highway, Hillburn, N. Y., has been approved as not excessive by the Public Service Commission of New York.

GRAND TRUNK WESTERN.—This company has completed plans for the construction of a highway underpass to carry Eight Mile road, Detroit, Mich., under its six-track line at a cost of $615,000. The tracks will be raised a maximum of nine feet over a distance of 5,900 ft., while the highway will be lowered 13 ft. A contract for the bridge structure, which will embody semi-through plate girders with a clear span of 60 ft. on special type concrete abutments, has been let to W. E. Lennane, Detroit.

GREAT NORTHERN.—A contract has been let to Peppard & Fulton, Sioux City, Iowa, for the construction of the foundation of a 250,000-bu. reinforced concrete addition to this company's grain elevator at Fourteenth street and Smith road, Sioux City. The contract for the main portion of the addition has been awarded to the Burrell Engineering & Construction Co., Chicago. The addition, which will contain 17 storage bins, will cost about $65,000.

ILLINOIS CENTRAL.—A contract has been let to the American Aggregates Company, Indianapolis, Ind., for the material for a fill to rearrange an existing connection with the Indianapolis Union at Indianapolis. This work was made necessary by the elevation of the Indianapolis Union tracks. Trackwork will be undertaken by company forces.

LONG ISLAND.—A contract for the construction of a bridge at Wantagh, Long Island, N. Y., has been awarded by this company to Foley Bros., Inc., of New York City.

LOUISVILLE & NASHVILLE.—This road has awarded two contracts in connection with the construction of a new bridge across the Tennessee river at Danville, Tenn. The new bridge, which will be on the same grade and alinement as the existing structure, is estimated to cost about $1,000,000. A contract for the construction of the piers has been let to the Dravo Construction Company, Pittsburgh, Pa., while the Virginia Bridge & Iron Company, Roanoke, Va., has been awarded the contract for furnishing and erecting the structural steel.

MISSOURI - KANSAS - TEXAS.—This road and Tulsa, Okla., have awarded a contract to H. L. Cannady, Tulsa, for the construction of a highway subway at that point.

NEW YORK CENTRAL.—This company contemplates the construction of an 80-ft. by 170-ft. addition to the enginehouse at its Collinwood yards, Cleveland, Ohio, at an approximate cost of $60,000.

NEW YORK CENTRAL.—The New York Public Service Commission has approved as not excessive a bid submitted by the Walsh Construction Company, Syracuse, N. Y., for the reconstruction of the highway bridge carrying Bridge street, East Syracuse, N. Y., over the New York Central tracks.

NORFOLK & WESTERN.—The Interstate Commerce Commission has authorized this company and the Big Sandy & Cumberland to construct a cut-off line 0.7 miles long, involving the construction of a tunnel, between the Knox Creek Ry. (leased by the Big Sandy) 3 miles southeast of Devon, W. Va., to a connection with the main line of the N. & W. 1.5 miles east or Devon; estimated cost, $750,000.

PENNSYLVANIA.—With the completion of all excavation and foundation work for this company's new Philadelphia, Pa., passenger station, and construction above ground already under way, erection of steel for the superstructure will go forward immediately, according to a recent statement by Robert Farham, chief engineer in charge of Philadelphia improvements. Steelwork in the superstructure will amount to about 12,500 tons, erection of which is expected to be completed by November 1. The necessary building permit for the station was issued on July 17 by the Philadelphia Bureau of Building Inspection, covering a six-story office building and terminal on a site 534 ft. by 591 ft. between Thirtieth and Market streets.

PERE MARQUETTE.—A contract has been awarded to the Jutton-Kelly Company, Detroit, Mich., for the construction of grade separation structures at Oakman boulevard and Ford road, Detroit, at a combined estimated cost of $500,000. A contract for the construction of a grade separation structure where the tracks of this road intersect Michigan avenue at Wayne, Mich., has been awarded to the same company. The approximate cost of this project is $100,000.

TERMINAL RAILROAD ASSOCIATION.—The St. Lou[illegible] (Mo.) Board of Public Service will open bids on August 18 for the erection and painting of approximately 7,000 tons of structural steel for the East St. Louis Union Station approach to the St. Louis Municipal bridge over the Mississippi river between East St. Louis, Ill., and St. Louis, Mo. The estimated cost of this work is $175,000.

Financial

BALTIMORE & OHIO.—*Acquisition of Alton Approved.*—The Interstate Commerce Commission on July 17 made public its report authorizing the Alton Railroad to acquire the property of the Chicago & Alton and authorizing the Baltimore & Ohio to acquire control of the Alton company by purchase of its capital stock. The Alton company was authorized to issue $25,000,000 of common stock and to assume obligation and liability in respect of the payment of dividends on stock of certain lessor companies, $45,350,000 of 50-year 3 per cent bonds of the C. & A., $3,895,400 of outstanding equipment trust obligations, and $1,500,000 of receivers' certificates. This was on condition that existing routes and channels of trade shall be maintained and that the B. & O. should undertake to abide by such findings as the commission may make with respect to the acquisition of the Kansas & Sidell, Casey & Kansas and Yale Short Line at their commercial value. The B. & O. promptly filed an agreement to accept the conditions and the certificate was made effective at once. Regarding the objections of the stockholders' protective committee, the commission said that it was satisfied that the commercial value of the properties is much

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BETTER FIRES

FIREBAR CORPORATION
CLEVELAND OHIO.

less than the amount of $125,000,000 for which the committee contended and that a denial of the application would result in the properties being thrown back on the courts for a continuation of the receivership or for resale at whatever price they would bring. "We are not advised," the commission said, "of any way in which, under all the circumstances, we could properly afford the stockholders the relief to which they assert they are entitled. The stockholders have been afforded ample opportunity in the courts to protect their equities in the properties. They have failed or have been unable to take advantage of that opportunity, and to whatever cause such failure may be attributed, their rights in the properties are gone. They have nothing left for us to protect." Commissioner Eastman, concurring in part, expressed the opinion that the commission should have received the evidence offered by the stockholders as to the dealings with Kuhn, Loeb & Co., and others looking to a reorganization of the Alton, although he said he had little reason to believe it would have affected the final conclusions materially, but he said the commission should have inquired more thoroughly into the expenses of the receivership and in connection with the acquisition of Alton bonds by the B. & O.

CHICAGO & NORTH WESTERN.—*Notes.*—The Interstate Commerce Commission has authorized this company to issue $3,000,000 of general mortgage 4½ per cent bonds of 1987 to be pledged as collateral security for a 3-month note for $2,000,000, bearing interest at 3½ per cent.

CHICAGO, ROCK ISLAND & PACIFIC.—*Abandonment.*—The Interstate Commerce Commission has authorized this company to abandon a branch line extending from Rush Springs, Okla., to a plant formerly owned by the Acme Cement Company.

CINCINNATI UNION TERMINAL COMPANY.—*Securities.*—This company has applied to the Interstate Commerce Commission for authority to issue and sell $12,000,000 of first mortgage 4¼ per cent bonds and $12,000,000 of 6 per cent short term notes to provide funds for the construction of the passenger terminal at Cincinnati. The company has been negotiating with J. P. Morgan & Co., and Kuhn, Loeb & Co., for the sale of the bonds, which are to be guaranteed by the proprietary companies, and it is proposed to sell the notes at par either to bankers or to the proprietary companies.

DENVER & RIO GRANDE WESTERN.—*Agreement for Construction of Dotsero Cutoff.*—This company and the Denver & Salt Lake have filed with the Interstate Commerce Commission an agreement reached between the two companies providing for the construction of the Dotsero cutoff in Colorado to connect the line of the D. & S. L. with that of the D. & R. G. W., together with an acceptance by the D. & R. G. W. of other conditions imposed by the Interstate Commerce Commission in connection with the application of the D. & R. G. W. for authority to acquire control of the D. & S. L. One of these was that it should offer to pay $155 a share for any minority stock of the D. & S. L. which should be offered it within six months, that being the price it had agreed to pay for the controlling interest.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—*Abandonment.*—The Interstate Commerce Commission has authorized this company to abandon a branch line extending from Hollister, Wis., to Camp No. 5, 3.4 miles.

NEW YORK, NEW HAVEN & HARTFORD.—*Trackage Rights.*—The Interstate Commerce Commission has authorized this company to operate under trackage rights over a line of railroad (about 2½ miles of track) in Bridgeport, Conn., owned by the Stanley Works, which company is authorized to abandon operation of the line.

OREGON SHORT LINE.—*Abandonment.*—The Interstate Commerce Commission has authorized this company to abandon its Conroy branch extending from Moyer Jct., Wyo., to Conroy, 2 miles.

SEABOARD AIR LINE.—*Protective Committee for Jacksonville, Gainesville & Gulf Bondholders.*—As a result of the default in interest due April 1 on the first mortgage 6 per cent bonds of the Jacksonville, Gainesville & Gulf, a subsidiary of the Seaboard Air Line, a protective committee of these bondholders has been formed under the chairmanship of Robert I. Curran, vice-president of the Hibernia Trust Company, New York.

Dividends Declared

Maine Central.—Preferred, $1.25, payable September 1 to holders of record August 15.

Mine Hill & Schuylkill Haven.—$1.50, payable August 1 to holders of record July 18 to July 31.

New Orleans, Texas & Mexico.—$1.75, payable August 31 to holders of record August 14.

Nashville, Chattanooga & St. Louis.—1½, payable August 3 to holders of record July 25.

Average Prices of Stocks and of Bonds

	July 21	Last week	Last year
Average price of 20 representative railway stocks..	70.51	69.01	118.10
Average price of 20 representative railway bonds..	91.56	91.58	94.43

THE ILLINOIS CENTRAL, on July 20, signed a contract for a section of space, 40 ft. by 100 ft., in the Travel and Transportation Building of the Century of Progress Exposition, to be held in Chicago in 1933.

WESTERN RAILROADS will place reduced passenger rates in effect on August 7 and 8, when the round-trip fare for chair cars and coaches will be approximately one cent, and that for Pullman and parlor cars approximately two cents, per mile.

TWO LAWS affecting the operation of motor trucks in Illinois have been rendered temporarily inoperative by an injunction granted in the Circuit Court at Springfield, Ill. On petition of 49 truck operators, the Secretary of State is restrained from collecting the higher fees called for in one of the bills, while the director of the Illinois Department of Public Works is restrained from imposing the provisions of the other law restricting the length and width of motor trucks.

Railway Officers

EXECUTIVE

Daniel Willard, president of the Baltimore & Ohio, has been elected also president of the Alton Railroad Company, successor to the Chicago & Alton, which was recently acquired by the B. & O. **H. B. Voorhees,** vice-president of the B. & O. and president of the Baltimore & Ohio Chicago Terminal, with headquarters at Chicago, has been elected also vice-president of the Alton, and will be in direct charge of all departments.

OPERATING

W. C. Rapp, superintendent of the Union Railway (Memphis), will assume the duties of joint agent of that road and the Missouri Pacific, with headquarters at Memphis, Tenn.

M. O. Bicknell has been appointed superintendent, in charge of operation and maintenance, of the Wichita Northwestern, with headquarters at Pratt, Kan., succeeding **Overton Hodges,** resigned. The office of assistant to co-receiver is abolished.

A. M. Stevenson, superintendent of the Owensboro division of the Louisville & Nashville, with headquarters at Owensboro, Ky., has been appointed assistant superintendent of the Cincinnati and Louisville divisions, with headquarters at Louisville, Ky.

The jurisdiction of **D. R. MacBain,** vice-president and general manager of the New York Central Lines west of Buffalo, with headquarters at Cleveland, Ohio, has been extended over the Ohio Central Lines, as has that of **W. F. Schaff,** assistant general manager at Cleveland. **W. H. Sullivan,** general superintendent of the Cleveland Terminal district, with headquarters at Cleveland, has had his jurisdiction extended over the Erie and Franklin divisions. **E. Thwaites,** general superintendent at Cleveland, has been transferred to Toledo, Ohio, with jurisdiction over the Toledo Terminal district, the Cleveland division and the Ohio Central Lines. **H. E. Speaks,** general superintendent of the Ohio Central Lines, at Columbus, Ohio, has been appointed assistant to the general superintendent, with headquarters at the same point. **L. S. Emery,** general manager of the Ohio Central Lines, has been appointed assistant to the operating vice-president of the New York Central Lines, with headquarters as before at Columbus.

J. L. Cameron, superintendent of the Edmonton division of the Canadian National, with headquarters at Edmonton, Alta., has been appointed assistant superintendent at the same point, to re-

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Per Ton Mile

MAINTENANCE records show that locomotives equipped with HUNT-SPILLER *Air Furnace* GUN IRON parts in the valves and cylinders make exceptional mileage.

This fact alone proves that the use of HUNT-SPILLER *Air Furnace* GUN IRON in the business end of a locomotive insures steam tight operation, greater efficiency and lower fuel consumption per ton mile.

Equip your locomotives with HUNT-SPILLER *Air Furnace* GUN IRON parts and increase your economies.

HSGI
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Cylinder Bushings
Cylinder Packing Rings
Pistons or Piston Bull Rings
Valve Bushings
Valve Packing Rings
Valve Bull Rings
Crosshead Shoes
Hub Liners
Shoes and Wedges
Floating Rod Bushings

Parts Finished for Application

Dunbar Sectional Type Packing
Duplex Sectional Type Packing
(Duplex Springs for Above Sectional Packing)
Cylinder Snap Rings
Valve Rings All Shapes

HUNT-SPILLER MFG. CORPORATION
J.G. Platt, Pres. & Gen. Mgr. V.W. Ellet, Vice-President.

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383 Dorchester Ave. South Boston, 27, Mass.

Canadian Representative: Joseph Robb & Co., Ltd., 997 Aqueduct St., Montreal, P. Q.
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HUNT-SPILLER *Air Furnace* GUN IRON

place **G. H. Linney**, who succeeds **J. D. Healy**, also assistant superintendent at Edmonton. Mr. Healy has been transferred to North Battleford, Sask., to relieve **P. G. Russell**, who has been transferred to the Smithers division, with headquarters at Smithers, B. C., where he relieves **G. A. Glay**, transferred. The position of superintendent of the Edmonton division, formerly held by Mr. Cameron, has been abolished and the operation of the division has been taken over by **W. I. Munro**, general superintendent at Edmonton. **J. H. McKinnon**, superintendent of the Kamloops division, with headquarters at Kamloops, B. C., has been appointed superintendent of the Duluth, Winnipeg & Pacific (part of the C. N. R.), with headquarters at Virginia, Minn., succeeding **C. L. Harris**, retired. The position of superintendent of the Kamloops division has been abolished, the duties being assumed by **B. T. Chappell**, general superintendent at Vancouver, B. C. **W. C. Owens**, superintendent of freight train service, with headquarters at Montreal, Que., has been appointed general superintendent at Saskatoon, Sask., succeeding **C. Forrester**, who has been appointed superintendent of the St. Thomas division, with headquarters at St. Thomas, Ont.

TRAFFIC

F. W. Griffin, assistant general passenger agent of the Missouri-Kansas-Texas of Texas, has been promoted to general passenger agent, with headquarters as before at Dallas, Tex., a newly created position.

Philip L. Johnson, general agent for the Wabash, at Houston, Tex., has been appointed assistant freight traffic manager, with headquarters at St. Louis, Mo., succeeding **S. King**, whose promotion to freight traffic manager was announced in the *Railway Age* of July 18. **A. P. MacInnis**, general agent at Salt Lake City, Utah, has been promoted to assistant general freight agent, with headquarters at St. Louis, Mo., succeeding **W. A. Hopkins**, who has been appointed general live stock agent at St. Louis. **G. W. Terry** succeeds Mr. MacInnis as general agent at Salt Lake City.

John W. Clark, assistant traffic manager of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at St. Louis, Mo., has been promoted to assistant vice-president, freight traffic, of the New York Central Lines with headquarters at Chicago, to succeed **W. T. Stevenson**, who has been transferred to New York. Mr. Clark has been associated with the New York Central and its affiliated lines for more than 41 years. He was born on April 22, 1870, at Fredonia, N. Y., and was educated at the Fredonia state normal school. He first entered railway service on June 6, 1890, as a clerk on the Dunkirk, Allegheny Valley & Pittsburgh (part of the New York Central). From this date until December, 1900, Mr. Clark served successively as agent and telegraph operator at Gerry, N. Y., chief clerk and ticket agent at Titusville, Pa., and then local agent at the same point. On the latter date he became traveling freight agent on the Cleveland, Cincinnati, Chicago & St. Louis and the West Shore (both parts of the N. Y. C.) at Pittsburgh, Pa. In July, 1909, Mr. Clark became commercial agent of these

John W. Clark

roads at the same point, being in January, 1911, appointed division freight agent of the Big Four, with headquarters at Cleveland, Ohio. Five years later he was promoted to assistant general freight agent at Cincinnati, Ohio, being further advanced to assistant traffic manager at St. Louis, in April, 1920. Mr. Clark's promotion to assistant vice-president became effective on July 20.

Dale E. Gilbert, who has been promoted to senior assistant freight traffic manager of the Wabash, has been connected with that road continuously for 25 years. He was born on November 17, 1888, at Attica, Ind., and after a year of college work, entered the service of the Wabash on July 23, 1906, as an office boy and clerk at Toledo, Ohio. After serving in various minor positions, Mr. Gilbert became a tracing clerk in the division freight office in 1907, and in 1909, he was promoted to chief clerk to the general agent at Pittsburgh, Pa. Later he served successively as soliciting freight agent and traveling freight agent. In December, 1911, Mr. Gilbert was appointed general agent and in this capacity opened the Cleveland (Ohio) agency. He was appointed division freight agent at Toledo on August 5, 1915, being promoted to assistant general freight agent at the same point on October 1, 1929. His promotion to senior assistant freight traffic manager with headquarters at St. Louis, Mo., became effective on July 7.

ENGINEERING AND SIGNALING

J. S. McBride, who has been appointed chief engineer of the Chicago & Eastern Illinois, with headquarters at Chicago, has been associated with the engineering department of that road for more than 26 years. He was born on November 4, 1880, at Louisville, Ky., and graduated from Rose Polytechnic Institute in 1905, with a degree in civil engineering. He entered the service of the C. & E. I. in June of the same year as a resident engineer on construction, and from January, 1906, to April, 1908, served in various positions in the engineering department, being on the latter date appointed assistant engineer of maintenance and construction. In April, 1914, Mr. McBride was advanced to valuation engineer, and two years later he was appointed principal assistant engineer, in which capacity he retained jurisdiction over valuation matters. In 1919, he resumed the position of valuation engineer and served in this capacity until his recent promotion to chief engineer, effective June 15.

Samuel Rollo Young, assistant chief engineer of the Atlanta & West Point, the Western of Alabama and the Georgia, has been promoted to chief engineer of those roads. Mr. Young was born on March 3, 1887, at Coatesville, Pa., and studied civil engineering at Lehigh University, graduating in 1909. He received his first railroad experience during the summer of 1902, as messenger boy in the car record office of the Pennsylvania, at Philadelphia. He re-entered the service of the Pennsylvania in 1910, as rodman on the Sunbury division of the Pennsylvania, continuing in that capacity until 1912, when he undertook other work. In May, 1916, he

Samuel Rollo Young

again became engaged in railroad work as assistant engineer of the Atlanta & West Point, the Western Railway of Alabama, and the Georgia, and from January to December, 1918, he served as division engineer of the Georgia. In December, 1918, he became district engineer of the three railroads mentioned above, and from December, 1919, to March, 1920, served only with the Georgia, as district engineer. On March 1, 1920, he was appointed assistant chief engineer of the three railroads, which position he held until his recent promotion.

OBITUARY

C. R. Lind, general passenger agent for the Chicago & North Western at Denver, Colo., died on July 10, at San Francisco, Cal., from injuries received when he fell down a flight of stairs.

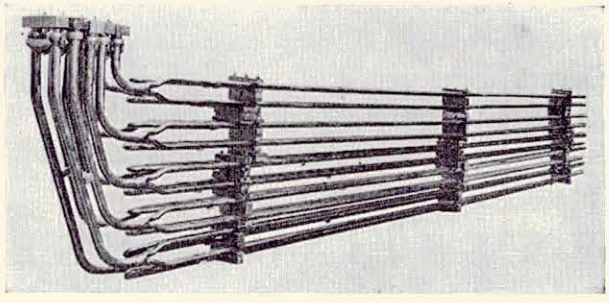
RED Versus BLACK

. . . to distinguish between new and remanufactured superheater units.

Those old unserviceable units, after Elesco remanufactures them, are so like new that we have to paint them RED. This makes it easier for the stores department to identify remanufactured units.

When unserviceable superheater units are remanufactured at the Elesco plant, they are returned to you with new return bends and new ball ends integrally forged with the tubing—new bands and supports—new unit bolts and nuts. They are virtually new units, and you may expect them to give the same service as new units.

Substitute repairs to superheater units may cost less initially than Elesco remanufacturing, *but* the effect of these repairs—no matter how carefully done—so reduces locomotive output that you pay for Elesco remanufacturing many times over.



Elesco Remanufactured Units Are Painted Red, While the New Units Are Painted Black, Otherwise It Would Be Difficult to Tell Them Apart.

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Peoples Gas Building
CHICAGO

Canada: The Superheater Company Limited, Montreal

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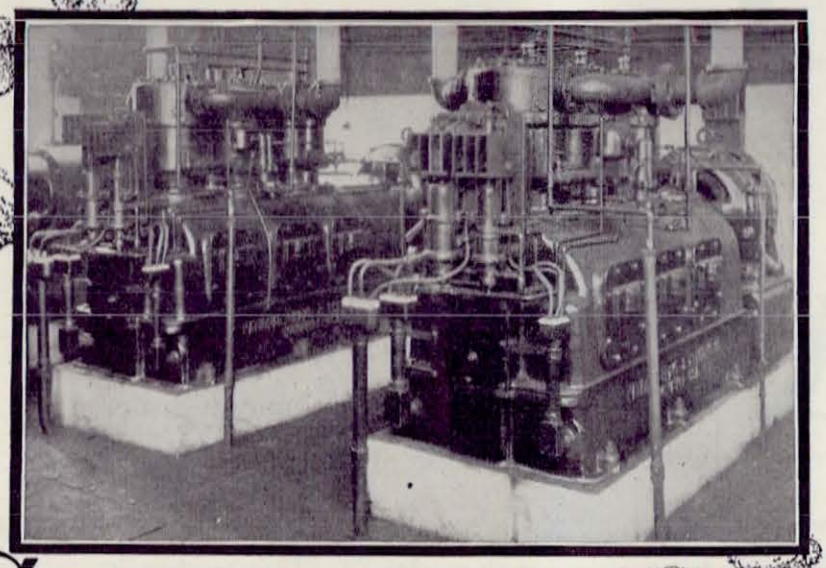
A-618



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JUST as the old time baker threw in an extra bun for good measure, so the builders of Westinghouse-National Air Compressors add extra value to the machines they build . . . . They save valuable space for the user by designing compact machines that are driven direct by the motor or through efficient herring-bone gearing . . . they save installation cost by making complete self-contained machines that need no elaborate foundation nor require extensive auxiliary apparatus . . . they save operating expense by providing complete Automatic Control of distinctive type—which insures that the power consumed will be in proportion to the air compressed . . . they save maintenance expense by building durable machines that will operate for a score of years with minimum time and material for attention and upkeep—thus maintaining the noteworthy tradition of "Quality Machines for Quality Service" . . . Sizes range from 2½ to 700 cu. ft. displacement—for shops, yards, car retarders, signals, etc.

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General Office and Works **Wilmerding, Pa.**

WESTINGHOUSE—NATIONAL AIR COMPRESSORS

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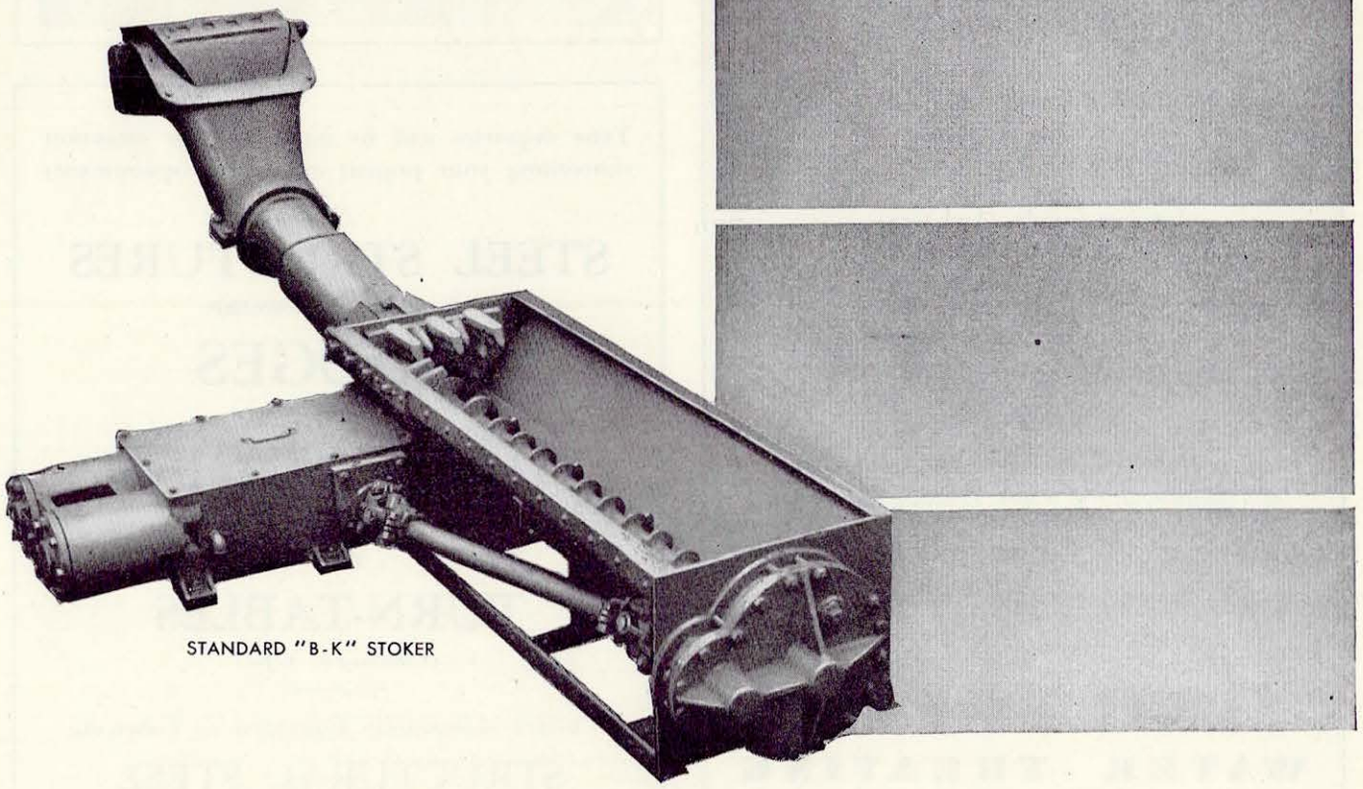
- Whatever the article may be, the only thing you ever buy is performance.
- It's performance, and performance alone, that determines its value to you.
- Standard Stokers have an enviable reputation of dependable performance. They are successfully and satisfactorily firing the power hauling most of the fast limited trains and practically all of the heavy, modern freight power.
- This performance is the result of untiring increasing effort to improve design, to improve the materials, to give longer life and dependability and to keep maintenance at a minimum.
- Every Standard Stoker and every replacement part is designed and built to give the utmost in dependability and in value for the purchase cost.



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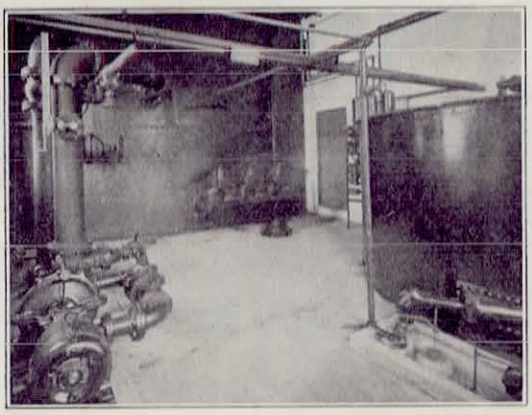
THE STANDARD STOKER COMPANY, Inc.

NEW YORK CHICAGO ERIE



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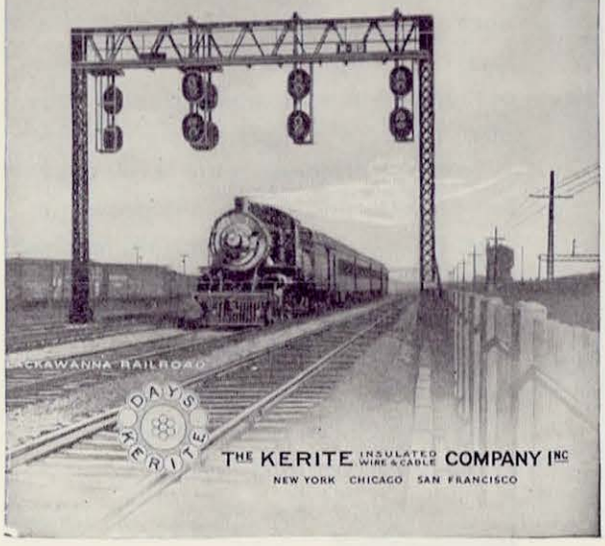

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MAGNUS COMPANY

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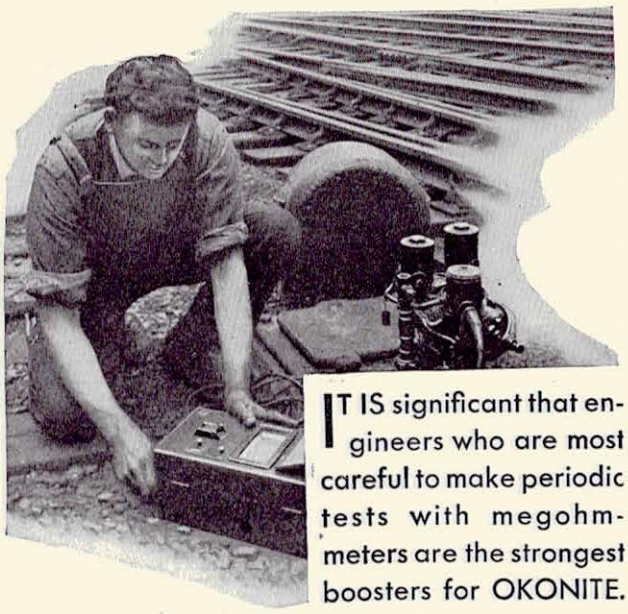
AND

Bronze Engine Castings

New York Chicago

THE MEGGER PROVES OKONITE QUALITY



IT IS significant that engineers who are most careful to make periodic tests with megohmmeters are the strongest boosters for OKONITE.

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Founded 1878

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General Electric Supply Corp., Boston, Mass.

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ROLLER SIDE-BEARINGS

Reduces Friction on Rails 15%
Lessens Wheel Flange Wear

STANDARD CAR TRUCK CO.

McCORMICK BUILDING CHICAGO

OHIO LOCOMOTIVE CRANES

ERECTION CRANES - LOGGING CRANES
WHARF, BARGE AND GANTRY CRANES
RAILROAD PILE DRIVERS
CRAWLER CRANES & SHOVELS

THE OHIO LOCOMOTIVE CRANE CO.

BUCYRUS, OHIO

A gleaming surface suggests faultless service

KEEPING buses clean builds good will for your line. A glistening body and sparkling windows suggest a well-kept bus . . . one that is safe to ride in and that gets its patrons there on time.

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Freight Car Door Fixtures

Corrugated Steel Freight Car Doors

CAMEL SALES COMPANY 332 South Michigan Avenue CHICAGO, ILLINOIS

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All Kinds of Freight Cars

Annual Capacity
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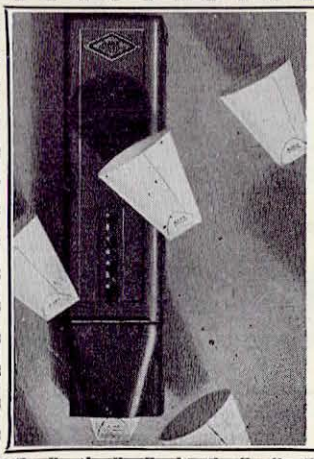
Individual Shop and Special Facilities for Rebuilding and Repairing Cars



Six Reasons Why Railroad Men Prefer Ajax Cup Equipment

1 — Ajax Cups are delivered open. Passengers like them because they fit the hand; do not drip, spill, collapse.

2 — Ajax Cups cannot be left standing around to spill on upholstery.

3 — Ajax Cabinets are easy to reload.

4 — Ajax Cabinets are sturdy, unbreakable, trouble-proof.

5 — Ajax Equipment is among the most economical on the market.

6 — Ajax Cup equipment was designed especially to meet railroad needs.

Samples and full information will be sent on request

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EASTERN CUP DIVISION:
Logan Drinking Cup Co. Div., Worcester, Mass.
WESTERN CUP DIVISION:
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MAGNUS COMPANY

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AND

Bronze Engine Castings

New York Chicago

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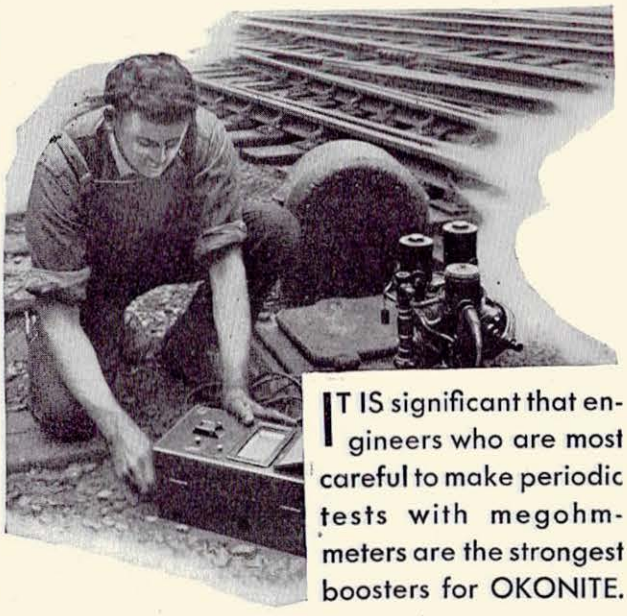

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KEEPING buses clean builds good will for your line. A glistening body and sparkling windows suggest a well-kept bus . . . one that is safe to ride in and that gets its patrons there on time.

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Corrugated Steel Freight Car Doors

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Annual Capacity { 12,000 Freight Cars; 125,000 { Chilled Tread Wheels; 20,000 Tons Forgings

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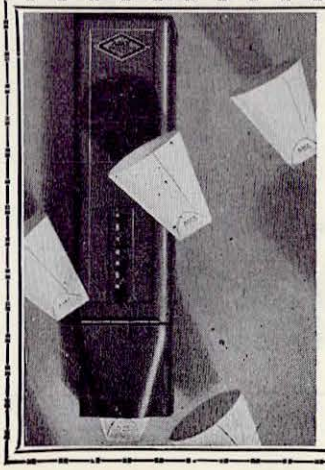

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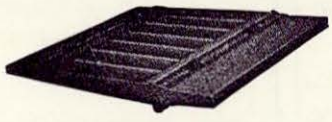
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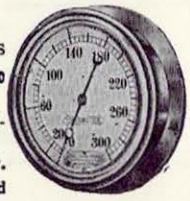

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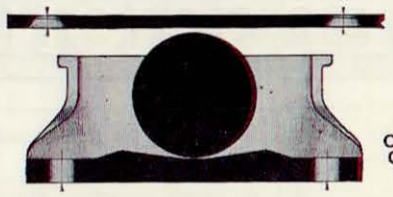
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For location of advertisements in this issue of manufacturers listed in the Buyers Index, see Advertisers Index on the last page next to cover

BUYERS INDEX

Accounting Machines.
Remington-Rand Business Service.

Acetylene, Dissolved.
Oxweld Railroad Service Co., The.

Aftercoolers, Air.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Air Brakes.
New York Air Brake Co.
Westinghouse Air Brake Co.

Aircraft Corrugated Sheet.
Aluminum Co. of America.

Aircraft Extruded & Rolled Shapes.
Aluminum Co. of America.

Aircraft Plates.
Aluminum Co. of America.

Aircraft Screw Machine Products.
Aluminum Co. of America.

Aircraft Streamline & Round Tubing.
Aluminum Co. of America.

Air Lifts.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Airport Drainage.
Republic Steel Corp.

Air Pumps.
New York Air Brake Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Air Reservoir Joints—(See Joints, Air Reservoir).

Alloy Steel.
Bethlehem Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Ryerson & Son, Inc., Jos. T.

Alloys, Strong Aluminum.
Aluminum Co. of America.

Angle Bars — (See Joints, Rail).

Angles, Channels and Tees—(See Shapes, Structural).

Anti-Creepers, Rail.
Bethlehem Steel Co.
P. & M. Company, The.

Arch, Locomotive Brick.
American Arch Co., Inc.

Arresters, Lightning.
General Electric Co.
General Railway Signal Co.
P. & M. Company.
Railroad Supply Co., The.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Ash Conveyors.
Industrial Brownhoist Corp.

Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Ash Pans, Cast Steel.
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Auxiliary Locomotive.
Bethlehem Steel Co.

Axles, Car and Locomotive.
American Locomotive Co.
Baldwin Locomotive Works.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Midvale Co., The.
Standard Steel Works Co.

Axles, Mine Car.
Brill Co., The J. G.
Mt. Vernon Car Mfg. Co.

Axles, Motor Trucks.
Timken-Detroit Axle Co.

Babbitt Metal.
National Bearing Metals Corp.
Ryerson & Son, Inc., Jos. T.
Westinghouse Elec. & Mfg. Co.

Baggage Door Controller Device.
Edwards Co., O. M.

Barges, Steel.
American Bridge Co.

Barges, Treated.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Bars, Concrete, Reinforcing.
Carnegie Steel Co.
Central Alloy Steel Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Bars, Iron and Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Illinois Steel Co.
Inland Steel Company.
Lockhart Iron & Steel Co.
McConway & Torley Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Bars, Rolled Steel.
Carnegie Steel Co.

Batteries, Lighting.
Electric Storage Battery Co.

Batteries, Starting.
Electric Storage Battery Co.

Batteries, Storage.
Electric Storage Battery Co.
Railroad Supply Co.
Safety Car Heating & Lighting Co.

Batteries, Wet Cell.
Electric Storage Battery Co.

Beams, Channel & Angle.
Carnegie Steel Co.
Illinois Steel Co.
Ryerson & Son, Inc., Joseph T.

Bearings, Axle Generator.
S. K. F. Industries, Inc.
Westinghouse Elec. & Mfg. Co.

Bearings, Ball Thrust.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Center.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Miner, W. H.
Pressed Steel Car Co.
Symington Co., The.

Bearings, Journal.
Fafnir Bearing Co.
Magnus Co., Inc.
National Bearing Metals Corp.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Journal Roller.
Fafnir Bearing Co.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Roller.
American Steel Foundries Co.
Fafnir Bearing Co.
Hyatt Roller Bearing Co.
Miner, W. H.
Shafer Bearing Corp.
S. K. F. Industries, Inc.
Standard Car Truck Co.
Stucki Co., A.
Timken Roller Bearing Co.
Wine Railway Appliance Co.

Bearings, Roller Side.
Q. & C. Company, The.
Standard Coupler Co.
Stucki Co., A.

Bearings, Side.
American Steel Foundries.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
Standard Car Truck Co.
Stucki Co., A.
Wine Railway Appliance Co.

Beds, Cast Steel, Locomotive.
General Steel Castings Corp.

Bell Ringer, Locomotive.
Ardco Mfg. Co.
Prime Mfg. Co., The.

Bells, Highway Crossing.
Railroad Supply Co.

Belt Lacing Machines.
Birdsboro Steel Foundry & Mach. Co.

Benders, Rail.
Q & C Co., The

Bending and Straightening Machines.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Billets, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
McConway & Torley Co.
Midvale Co., The.
Ryerson & Son, Jos. T.
Republic Steel Corp.
Standard Steel Works Co.

Blocks, Chain.
Barco Mfg. Co.

Blocks, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Blooms, Steel.
Carnegie Steel Co.
Republic Steel Corp.

Blower Fittings, Automatic Smokebox.
Barco Mfg. Co.

Blowers, Turbo.
Ingersoll-Rand Co.

Blowtorches, Acetylene.
Oxweld Railroad Service Co., The.

Boiler (all types).
Baldwin Locomotive Works, The.

Boiler Checks.
Prime Manufacturing Co., The.

Boilers, Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Lima Locomotive Works.

Boilers, Scale Proof.
Industrial Brownhoist Corp.

Bolsters, Steel.
American Steel Foundries.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Gould Coupler Co., The.
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The
Pressed Steel Car Co.
Symington & Son, Inc., T. H.

Bolts and Nuts.
Baldwin Locomotive Works, The
Bethlehem Steel Co.
Buffalo Brake Beam Co.
Dardelet Threadlock Corp.
Neely Nut & Bolt Co.
Russell, Burdsall & Ward Bolt and Nut Co.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Bolts & Nuts, Monel Metal.
International Nickel Co., The.

Bolts, Patch.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Bolts, Track.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Bonders, Rail.
Q & C Co., The.

Bonding Rail Outfits.
Ingersoll-Rand Co.

Bonds, Rail.
American Steel & Wire Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Bonds, Signal.
American Steel & Wire Co.
Railroad Supply Co.

Bond, Wire Protection.
P & M Co., The.

Boosters, Locomotives.
Franklin Railway Supply Co., Inc.

Boring & Drilling Machines, Horizontal.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Boring Machines, Car Wheel
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Horizontal.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Vertical.
Sellers & Co., Inc., Wm.

Braces, Rail
Bettendorf Co., The.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q & C Co., The.
Ramapo Ajax Co.
Symington Co., The.

Brake Beam Safety Guards.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

Brake Beam Supports.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

Brake Beams.
American Steel Foundries.
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car. Co.

Brake Drums.
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

Brake Forgings, Pins, Levers, etc.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Schaefer Equipment Co.

Brakes, Hand.
National Brake Co.

Brake Heads.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Pressed Steel Car Co.

Brake Jaws.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.

Brake Shoes.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.
Wheel Truing Brake Shoe Co.

Brake Shoes, Wheel Truing
Wheel Truing Brake Shoe Co.

Brakes, Air.
General Electric Co.
New York Air Brake Co.
Westinghouse Air Brake Co.

Brakes, Clasp.
American Steel Foundries.

Brakes, Electric.
New York Air Brake Co.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

Brass, Sash.
Edwards Co., O. M.

Brick, Locomotive Arch.
American Arch Co., Inc.

Bridge Builders.
American Bridge Co.
Bethlehem Steel Co.

Bridge & Brossing Planks, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Flooring.
Carey Co., The, Philip.

Bridge Material, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Stringers — (See Stringers, Bridge).

Bronze Powder, Aluminum.
Aluminum Co. of America.

Bucket Handling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Buffers, Friction.
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Materials.
Carey & Co., Philip, The.
Johns-Manville Corp.

Buildings, Iron, Steel and Steel Concrete.
American Bridge Co.
United Engineers & Constructors, Inc.

Bulldozers.
Ryerson & Son, Joseph T.

Buses, Motor.
Reo Motor Car Co.

Cable Accessories, Electrical.
Graybar Electric Co.

Cables, Electric.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Cableways—(See Tramways).

Caps, Grease.
Prime Mfg. Co., The.

Carbide, Calcium.
Oxweld Railroad Co., The.
Union Carbide Sales Co.

Car Insulation.
Carey & Co., Philip, The.
Wood Conversion Co.

Car Lighting Equipment—(See Lighting, Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.

Car Parts and Appliances.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Car Parts, Freight.
Bettendorf Co., The.
General American Tank Car Corporation.
Pressed Steel Car Co.

Car Parts, Passenger.
Brill Co., The J. G.
St. Louis Car Co.

Car Repairs.
General American Tank Car Corporation.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

Car Retarder Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Car Siding — (See Siding, Car, etc.).

Cars, Baggage.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Cars, Ballast.
Bethlehem Steel Co.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Caboose, Coal & Stock.
Mt. Vernon Car Mfg. Co.

Cars, Convertible.
Mt. Vernon Car Mfg. Co.

Cars, Dump.
Bethlehem Steel Co.
Bettendorf Co., The.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Bettendorf Co., The.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

Cars, Freight (New and Repaired).
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

Cars, Gasoline Motor.
Brill Co., The J. G.

Cars, Hand & Push.
Fairbanks-Morse & Co.

Cars, Industrial.
Bethlehem Steel Co.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Motor.
Fairbanks-Morse & Co.

Cars, Motor Inspection.
Fairbanks-Morse & Co.

Cars, Oil Electric.
Westinghouse Elec. & Mfg. Co.

Cars, Ore.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Passenger.
Bethlehem Steel Co.
Brill Co., The J. G.
Electro-Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Cars, Power Units.
Brill Co., The J. G.
Electro-Motive Co.

Cars, Quarry.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Cars, Second-Hand.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Brill Co., The J. G.
Electro-Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

Cars, Spreader.
Western Wheeled Scraper Co.

Cars, Tank.
Bethlehem Steel Co.
General American Tank Car Corp.
Indian Refining Co.
Pressed Steel Car Co.

Cars, Dump.
Western Wheeled Scraper Co.

Castings, Alloy Steel.
Symington Co., The.
Union Spring & Mfg. Co.

Castings, Brass and Bronze.
Baldwin Locomotive Works, The.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

Castings, Gray Iron.
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works.
General Railway Signal Co.
Mt. Vernon Car Mfg. Co.
Ramapo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron & Steel.
Baldwin Locomotive Works, The.
Industrial Brownhoist Corp.

Castings, Malleable Iron.
Buckeye Steel Castings Co.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Castings, Monel Metal.
International Nickel Co., The.

Castings, Steel.
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The.
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Birdsboro Steel Foundry & Machine Co.
General Steel Castings Corp.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Castings, Steel Vanadium.
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Catchbasins, Iron.
Armco Culvert Mfrs. Assoc.

Cellers, Engine Truck.
Ardco Mfg. Co.

Cement Car, Asphalt.
Lehon Co., The.
Sherwin-Williams Co.

Cement, High Temperature.
Carey Co., Philip, The.
Johns-Manville Corp.

Cements, Asbestos and Magnesia.
Carey Co., Philip, The.

Center Plates—(See Bearings, Center).

Center Sills.
Bettendorf Co., The.
Bradford Corporation.

Chain, Monel Metal.
International Nickel Co., The.

Chemicals.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

Chemicals, Boiler.
Bird-Archer Co., The.
Dearborn Chemical Co.

Chemicals, Cleaning.
Oakite Products, Inc.

Chemists.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chromium Plating.
Worthington Pump & Machinery Corp.

Chucks, Lathe.
Ryerson & Son, Jos. T.

Cinder Handling Plants.
Roberts & Schaefer Co.

Circuit Breakers.
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Forging.
Ryerson & Son, Jos. T.

Clamps, Guard Rail.
O. & C. Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Clamps, Rail Cutting.
Oxweld Railroad Service Co., The.

Classification Yard Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Cleaners, Aircraft.
Oakite Products, Inc.

Cleaners, Air Pump.
Oakite Products, Inc.
Westinghouse Air Brake Co.

Cleaners, Bus & Truck.
Oakite Products, Inc.

Cleaners, Car.
Oakite Products, Inc.

Cleaners, Flue.
Ryerson & Son, Jos. T.

Cleaners, General.
Oakite Products, Inc.

Cleaners, Locomotive.
Oakite Products, Inc.

Cleaners, Metal.
Oakite Products, Inc.

Clips, Wire Rope.
American Steel & Wire Co.

Coach and Coach Yard Steam Joints—(See Joints, etc.)

Coaches, Motor.
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

Coaches, SecondHand.
Hyman-Michaels Co.

Coal, Ore & Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

Coal Pushers.
Standard Stoker Co.

Coaling Stations.
American Bridge Co.
FairbanksMorse & Co.
Roberts & Schaefer Co.

Cocks, Angle.
Westinghouse Air Brake Co.

Cocks, Blow-Off.
Bird-Archer Co., The.

Cocks, Cylinder.
Prime Manufacturing Co., The.

Columns, Water.
Prime Manufacturing Co., The.

Combination Crane Pile Drivers.
Industrial Brownhoist Corp.

Compounds, Boiler.
Dearborn Chemical Co.
Bird-Archer Co., The.

Compounds, Cleaning.
Oakite Products, Inc.

Compounds, Cutting.
Oakite Products, Inc.

Compounds, Grinding.
Oakite Products, Inc.

Compounds, Paint Removing.
Oakite Products, Inc.

Compounds, Rust Proofing.
Oakite Products, Inc.

Compressors, Air.
Ingersoll-Rand Co.
New York Air Brake Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Concrete Floor Slabs.
Federal American Cement Tile Co.

Concrete Reinforcement.
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Son, Jos. T.

Concrete Roofing, Tile.
Federal American Cement Tile Co.

Condensers.
Ingersoll-Rand Co.

Condensing Apparatus.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Conduit, Rigid.
Aluminum Co. of America.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

Conduit, Underground.
Graybar Electric Co.
Johns-Manville Corp.

Connections, Lever.
National Malleable & Steel Castings Co.

Connections, Truck.
National Malleable & Steel Castings Co.

Connections, Truck Lever.
Schaefer Equipment Co.

Contraction Joint.
General Railway Signal Co.

Control Devices, Train Speed.
Union Switch & Signal Co.

Control, Locomotive.
Valve Pilot Co.

Controllers, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Corrugated Sheet.
Aluminum Co. of America.

Conveyor, Ash—(See Coal, Ore and Ash Handling Mach.).

Coupler Pockets—(See Draft Yokes).

Coupler Yokes.
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Gold Car Heating & Lighting Co.
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Cranes, Ballast Cleaning.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Barge.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Bracket.
Shephard-Niles Crane & Hoist Corp.

Cranes, Crawler.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Crawling Shovels and Draglines.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Diesel.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Electric Traveling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Gantry.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.

Cranes, Gasoline.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Grab Bucket.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Handpower.
Industrial Brownhoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Jib.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Worthington Pump & Machinery Corp.

Cranes, Locomotive.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Overhead.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Pillar.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Portable.
Orton Crane & Shovel Co.

Cranes, Transfer.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Traveling.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Wharf.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Wrecking.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Crank Pins — (See Pins, Crank).

Creosote.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.

Creosote, Wood Preservative Treatment.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Cribbing Units.
Federal American Cement Tile Co.

Cross Arms, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cross Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cross Ties, Steel.
Bethlehem Steel Co.

Crossheads & Shoes.
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.

Crossing Signals & Signs.
Railroad Supply Co.

Crossings—(See Frogs and Crossings).

Crossings, Pavement.
Carey Co., The Philip.

Crushers, Coal.
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.

Culverts.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.

Culverts, Corrugated Iron
Armco Culvert Manufacturers' Association.
Republic Steel Corp.

Culverts, Part Circle
Armco Culvert Manufacturers Association

Culverts, Treated.
Century Wood Preserving Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cups, Oil.
Hammett, H. G.
New York Air Brake Co.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Curtains & Fixtures, Car Window.
Pantasote Co., Inc., The.

Curtain Material, Car.
Ryerson & Son, Jos. T.

Curtains, Cab.
Lehon Co., The.

Cutting and Welding Apparatus.
Oxweld Railroad Service Co.
Westinghouse Electric & Mfg. Co.

Cut-Off Indicators and Recorders.

Cylinder Parts, Finished and Rough.
National Tube Co.
Valve Pilot Co.

Cylinders, Air Brake.
Westinghouse Air Brake Co.

Cylinders, Cast Steel Locomotive.
General Steel Castings Corp.
Union Steel Casting Co.

Cylinders, Oxy-Acetylene.
Oxweld Railroad Co., The.

Deoxidizers.
Q & C Co., The.
Vanadium Corp. of America.

Derricks.
Industrial Brownhoist Corp.

Diesel Electric Power Plants.
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.

Dirt Collectors.
New York Air Brake Co.
Westinghouse Air Brake Co.

Disinfectants.
West Disinfecting Co.

Dispatching Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Ditching Machinery.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Door Fixtures — (See Fixtures, Car Door).

Doors, Car.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.

Doors, Locomotive Firebox.
Franklin Railway Supply Co., Inc.

Doors, Rolling, Steel.
Kinnear Mfg. Co.

Draft Arms.
American Steel Foundries.
Birdsboro Steel Foundry & Machine Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.

Draft Gear Attachments.
Symington Co., The

Draft Gears.
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.

Draft Yokes.
American Steel Foundries.
Bettendorf Co., The.
Buckeye Steel Castings Co.
Gould Coupler Co., The.
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Drainage Gates, Automatic
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drains, Perforated Iron.
Republic Steel Corp.

Drawbar Centering Device.
Gould Coupler Co., The.
Miner, W. H.

Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.

Dredging Machinery.
Industrial Brownhoist Corp.

Drilling Machines.
Sellers & Co., Inc., Wm.

Drilling Machines, Bonding.
Railroad Supply Co.

Drilling Machines, Pneumatic
Ingersoll-Rand Co.

Drilling Machines, Rock.
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Drills.
Ingersoll-Rand Co.

Drills, Close Corner.
Ingersoll-Rand Co.

Drills, Concrete.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Steel Rock and Steel Sharpened.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Track & Bending.
Bird-Archer Co., The.
Ingersoll-Rand Co.

Drive Gas Electric Coaches.
General Electric Co.

Drive Gas Electric Locomotives
Westinghouse Electric & Mfg. Co.

Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.

Drop Door Mechanism.
Wine Railway Appliance Co.

Dynamos—(See Generators, Electric).

Electrical Cable Accessories.
General Electric Supply Corp.

Electric Cables.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Electrical Instruments.
Electric Service Supplies Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Electrical Supplies.
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Electrification, Railroad.
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Electric Heaters.
General Electric Supply Corp.

Electrical Insulation.
General Cable Corp.
General Electric Supply Corp.

Electrical Porcelain Insulators.
General Electric Supply Corp.

Electric Motors.
General Electric Supply Corp.

Electric Rivet Heaters.
General Electric Supply Corp.

Electric Switches.
General Electric Supply Corp.

Enamels.
Lowe Bros. Co., The.
Sherwin-Williams Co.

End Frames, Cast Steel, Passenger Car.
General Steel Castings Corp.

Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.

Engineers, Consulting, Civil, Elec., Hydraulic. Mechanical.
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Contracting.
Battey & Kipp.
United Engineers & Constructors, Inc.

Engineers and Contractors.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Construction.
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.

Engineers and Contractors, Elec., Hydraulic, Mech.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.

Engineers, Inspecting.
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.

Engineers, Valuation.
Hunt Co., Robert W.
United Engineers & Constructors, Inc.

Engines, Crude & Fuel Oil.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Diesel.
Worthington Pump & Machinery Corp.

Engines, Gas.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Engines, Gas & Gasoline.
American Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Hoisting.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Excavators.
Industrial Brownhoist Corp.

Exhaust & Heater Pipe.
Union Asbestos & Rubber Co.

Exhaust & Ventilating Fans.
General Electric Supply Corp.

Expanders, Tube.
Ryerson & Son, Joseph T.

Fans, Exhaust & Ventilating.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Fasteners, Car Door.
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Feed Water Heater Systems.
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.

Fencing Wire—(See Wire, Fence).

Fence Posts, Treated.
American Steel & Wire Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Ferro Alloys.
Vanadium Corp. of America.

Ferro, Chromium.
Vanadium Corp. of America.

Ferro, Molybdenum.
Electro Metallurgical Sales Corp.
Vanadium Corp. of America.

Ferro, Silicon.
Vanadium Corp. of America.

Ferro, Tungsten.
Vanadium Corp. of America.

Ferro, Vanadium.
Vanadium Corp. of America.

Filters, Air.
New York Air Brake Co.
Westinghouse Air Brake Co.

Filters, Water & Industrial.
Graver Tank & Mfg. Corp.

Filtration Plants (Water).
Graver Tank & Mfg. Corp.

Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works.

Fire Fighting & Protection Equipment.
Johns-Manville Corp.

Fittings, Air Brakes.
Westinghouse Air Brake Co.

Fittings, Steam.
Vapor Car Heating Co., Inc.

Fixtures, Car Door.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Flangers, Snow.
Q & C Co., The.

Floodlights.
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg. Co.

Floodlights, Acetylene.
Oxweld Railroad Service Co., The.

Flooring.
Carey & Co., Philip, The.
Johns-Manville Corp.

Flooring, Car.
Tuco Products Corp.

Flooring, Coach.
Tuco Products Corp.

Flooring, Composition.
Johns-Manville Corp.
Tuco Products Corp.

Flooring, Treated.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
National Lumber & Creosoting Co.

Floor Plates, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Company

Floor Slabs, Concrete.
American Cement Tile Mfg. Co.

Flue Cleaners—(See Cleaners, Flue).

Flue Cutters—(See Cutters, Flue).

Flues, Boiler—(See Tubes, Boiler).

Flue Shop Equipment.
Ryerson & Son, Joseph T.

Forges, Rivet Heating.
Ryerson & Son, Joseph T.

Forging Hammers.
Industrial Brownhoist Corp.

Forgings.
American Bridge Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Bethlehem Steel Co.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The.
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Neely Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

Forgings, Drop.
Baldwin Locomotive Works, The.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

Forgings, Monel Metal.
International Nickel Co., The.

Foundry Supplies.
Bird-Archer Co., The.

Frames, Cast Steel Locomotive
General Steel Castings Corp.

Frames, Locomotive.
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Machine Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Machine Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The.

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Machine Co.
Union Steel Casting Co.

Frogs and Crossings.
Bethlehem Steel Co.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Electric.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Furnaces, Gasoline.
Railroad Supply Co.

Furnaces, Rivet Heating—(See Forges, Rivet Heating).

Furniture.
Aluminum Co. of America

Gage Testers—(See Testers, Gage).

Gages, Air.
Westinghouse Air Brake Co.

Gages, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Gages, Steam.
Ashton Valve Co.

Gages, Tire.
Schrader's Son, Inc., A.

Gages, Wheel Press Recording.
Ashton Valve Co.

Gaskets.
Westinghouse Air Brake Co.

Gasoline.
Ethyl Gasoline Corp.

Gear Blanks, Rolled Steel.
Edgewater Steel Co.
Standard Steel Works Co.

Gears and Pinions.
American Steel Foundries.
Westinghouse Elec. & Mfg. Co.

Gears, Silent.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Railroad Service Co.

Generators, Car Lighting.
Safety Car Heating & Lighting Co.

Generators, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Goggles, Welding.
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Grapples, Wood.
Industrial Brownhoist Corp.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates.
Firebar Corp.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.

Grey Iron.
American Brake Shoe & Foundry Co.

Grinders, Internal.
Micro Machine Co.

Grinders, Portable Crank Pin.
Micro Machine Co.

Grinding Machines.
Sellers & Co., Inc., Wm.

Grinding Machines, Portable.
Ingersoll-Rand Co.
Ryerson & Son, Inc., Joseph T.

Guard Rails, Treated.
Curtin-Howe Corp.
International Creosoting & Construction Co.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rails (One Piece).
Bethlehem Steel Co.
Ramapo Ajax Corp.

Guard Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Gould Coupler Co., The.
Symington Co., The.

Hair Felt.
Johns-Manville Corp.

Hammers, Pneumatic.
Ingersoll-Rand Co.

Hammers, Riveting.
Ingersoll-Rand Co.

Hammers, Steam.
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Ball Bearing.
S. K. F. Industries, Inc.

Hand Rails & Fittings.
Aluminum Co. of America.

Hangers, Bottom Rod Safety.
Chicago Railway Equipment Co.

Hangers, Car Door—(See Fixtures, Car Door).

Headgates, Sliding
Armco Culvert Manufacturers Association

Headlight Repair Parts, Electric.
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Headlights, Electric.
General Electric Co.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

Headlights, Reflectors & Cases.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Heaters, Electric.
Gold Car Heating & Lighting Co.
Westinghouse Electric & Mfg. Co.

Heaters, Feedwater.
Graver Tank & Mfg. Corp.

Heaters, Feedwater Locomotive.
Coffin Co., Jr., The J. S.
Superheater Company, The
Worthington Pump & Machinery Corp.

Heaters, Feed Water, Stationary.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Heating & Ventilating Apparatus.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Westinghouse Electric & Mfg. Co.

Heating Equipment, Car.
Gold Car Heating & Lighting Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Heating Systems, Car (Electric and Steam).
Gold Car Heating & Lighting Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

High Temperature Cements.
Carey & Co., Philip, The.

Highway Crossing Protection Devices.
American Bridge Co.
Franklin Railway Supply Co., Inc.
Griswold Signal Co.
Railroad Supply Co.

Hoists, Chain.
Milwaukee Electric Crane & Hoist Corp.
Ryerson & So.., Jos. T.

Hoists, Electric.
Milwaukee Electric Crane & Hoist Corp.

Hoists, Pneumatic.
Ingersoll-Rand Co.

Hoisting Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Horns, Pneuphonic.
Westinghouse Air Brake Co.

Hose, Air, Steam, Etc.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Hose, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Hose, Tender.
Westinghouse Air Brake Co.

Incandescent Lamps.
General Electric Supply Corp.

Indicators, Speed & Cut-off.
Valve Pilot Co.

Ingots.
Birdsboro Steel Foundry & Machine Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

Injectors, Exhaust Steam.
Sellers & Co., Inc., Wm.
Superheater Co., The.

Inspection of Material and Equipment—(See Engineers, Inspection).

Insulated Wire.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Insulation, Car.
Carey Co., Philip, The.
Wood Conversion Co.

Insulation, Car, Bldg.
Carey Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.
Tuco Products Corp.
Union Asbestos & Rubber Co.
Wood Conversion Co.

Insulation, Electrical.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Insulation, Exhaust & Heater Pipe.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Heat.
Carey Co., Philip, The.
Miner, W. H.

Insulation Tape.
General Electric Supply Corp.

Insulators, Electrical, Porcelain.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Interlocking Plant Equipment.
General Railway Signal Co.
Union Switch & Signal Co.

Iron Chain.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Charcoal.
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Forging Billets.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.

Iron, Refined.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron, Staybolt — (See also Staybolts).
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Jacking, Locomotive.
Carey Co., Philip, The

Jacking Method of Installing Pipe
Armco Cuvert Manufacturers Association

Jacks, Smoke.
Carey Co., Philip, The.
Johns-Manville Corp.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co. Inc.

Joints, Flexible Ball.
Barco Mfg. Co.

Joints, Rail.
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

Joints, Steam, Air & Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Swing.
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

Journal Boxes and Lids.
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Journal Oilers, Car & Locomotive.
Ardco Mfg. Co.

Keys, Brake Shoe.
Bradford Corporation.
Buffalo Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

Knuckles, Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
General Electric Supply Corp.
Sherwin-Williams Co.

Ladders, Steel Car.
Wine Railway Appliance Co.

Lagging, Locomotive.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lamps, Incandescent.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lamps, Inspector's.
Oxweld Railroad Service Co., The.

Lath, Metal.
Armco Railroad Sales Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lead, White.
National Lead Co.

Lighting Equipment, Car.
Electric Storage Battery Co.
Safety Car Htg. & Ltg. Co.

Lighting Fixtures and Systems.
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.
Safety Car Htg. & Ltg. Co.

Lighting Plants, Gas, Electric
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.

Lightning Arresters.
General Electric Supply Corp.

Line Material.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lock Nuts—(See Nut Locks)

Locomotive Jacket Sheets.
Armco Railroad Sales Co.

Locomotive Water Conditioners
Bird-Archer Co., The.

Locomotives, Contractors.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works.

Locomotives, Gas-Electric.
Brill Co., The J. G.
Electro-Motive Co.

Locomotives, Geared.
Lima Locomotive Works

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Oil Engine, Electric Driven.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb Locomotive Co., The.

Locomotives, Rebuilt.
American Locomotive Co.

Locomotives, Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotive Stokers.
Standard Stoker Co.

Locomotive Valve Pilot.
Valve Pilot Co.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rod.
Q & C Co., The.

Lumber, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lumber, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Machinery, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Machine Screws, Monel Metal
International Nickel Co., The.

Magnets, Lifting.
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

Mechanical Draft Apparatus—(See Heating and Vent. App.).

Mechanical Stokers.
Standard Stoker Co.

Melters, Snow, Electric.
Q & C Co., The.

Metallic Flexible Conduit.
General Electric Supply Corp.

Meters, Water & Oil.
Worthington Pump & Machinery Corp.

Milling Machines, Planer Type.
Sellers & Co., Inc., Wm.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Milling Machines, Portable Frame Jaw.
Micro Machine Co.

Mohair Upholstery Velvets.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Molybdenum Metal.
Vanadium Corp. of America.

Monel Metal, Rods, Sheets, Tubes, Wire, etc.
International Nickel Co., The.

Motors, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Motors & Generators.
Fairbanks-Morse & Co.

Moulding.
Aluminum Co. of America.

Multiple V Belt Drives.
Worthington Pump & Machinery Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nipples, Air Hose.
Prime Manufacturing Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nozzles, Oxy-Acetylene Cutting.
Oxweld Railroad Service Co., The.

Nuts—(See Bolts and Nuts).

Nut Locks.
Dardelet Threadlock Corp.
Grip Nut Co.

Nuts, Tank Hose.
Prime Manufacturing Co., The.

Office Appliances.
Remington-Rand Business Service.

Oil-Electric Locomotives.
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

Oil Filtering & Storage Systems.
Graver Tank & Mfg. Corp

Oil, Linseed.
National Lead Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oxy-Acetylene Apparatus.
Oxweld Railroad Service Co., The.

Oxygen.
Oxweld Railroad Service Co., The.

Packing.
Westinghouse Air Brake Co.

Packing, Air Pump.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

Packing, Asbestos.

Packing, Cylinder and Valve Ring.
Johns-Manville Corp.
Hunt-Spiller Mfg. Corp.
Westinghouse Air Brake Co.

Packing, Locomotive Cab Cock.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Ring Boiler.
Union Asbestos & Rubber Co.

Packing, Semi-Metallic.
Pilot Packing Co.
Central Alloy Steel Corp.

Packing, Sheet.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Soft.
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

Packing, Throttle.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing Valve Stem.

Paint Burners, Acetylene.
Oxweld Railroad Service Co., The.

Paint, Metal Protective.
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

Paint, Powder.
Aluminum Co. of America.

Paint Spraying Equipment.
De Vilbiss Mfg. Co., The.

Paints.
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

Paper, Carbon.
Remington-Rand Business Service.

Paper, Sheathing.
Carey & Co., Philip, The.

Patterns, for Iron, Steel & Brass Castings.
Baldwin Locomotive Works, The.

Pavement Breakers.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pickling Equipment, Monel Metal.
International Nickel Co., The.

Pile Drivers.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Piling, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Piling, Sheet Steel.
American Bridge Co.
Carnegie Steel Co.
Inland Steel Company

Pilot Beams, Cast Steel.
General Steel Castings Corp.
Gould Coupler Co., The.

Pilots, Cast Steel.
General Steel Castings Corp.
Locomotive Finished Material Co.

Pins, Air Brake & Clevis.
Champion Rivet Co.

Pins, Center.
Miner, W. H.

Pins, Coupler Knuckle.
Champion Rivet Co.
McConway & Torley Co.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works.
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

Pipe, Corrugated Iron
Armco Culvert Manufacturers Association

Pipe, Paved Invert
Armco Culvert Manufacturers Association

Pipe Coverings.
Carey & Co., Philip, The.
Johns-Manville Corp.
Keasby & Mattison Co.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

Pipe, Perforated Iron
Armco Culvert Manufacturers Association

Pipe, Spiral Welded.
Armco Railroad Sales Co.

Pipe, Steel Signal.
National Tube Co.

Pipe, Spiral Welded.
Armco Railroad Sales Co.

Pipe, Wrought Iron.
Byers Co., A. M.
Reading Iron Co.

Planers, Plate.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Plates.
Steel Car Forge Co.

Plates, Follower.
Steel Car Forge Co.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center—(See Bearings, Center).

Plates, Iron & Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Plate & Sheet Metal Work.
Baldwin Locomotive Works, The.

Plates, Tie.
Illinois Steel Co.
Inland Steel Company.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Gould Coupler Co., The.
Standard Coupler Co.

Platforms, Cast Steel, Passenger Car.
General Steel Castings Corp.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Brill Co., The J. G.
Q & C Co., The.

Plush, Mohair.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles, Signal.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
General Railway Signal Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.
Union Switch & Signal Co.

Poles, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
General Electric Supply Corp.
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Poles, Steel Tubular.
Graybar Electric Co.
National Tube Co.

Posts, Fence, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Posts, Steel Fence.
American Steel & Wire Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

Power Plants.
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.

Preservatives, Wood.
Century Wood Preserving Co
Curtin-Howe Corp.
National Lumber & Creosoting Co.

Presses, Flanging Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Presses, Hydraulic.
Baldwin-Southwark Corp.
Birdsboro Steel Foundry & Machine Co

Presses, Wheel.
Birdsboro Steel Foundry & Machine Co.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pumping Stations.
Fairbanks-Morse & Co.

Pump Liners, Monel Metal.
International Nickel Co., The.

Pump Rods, Monel Metal.
International Nickel Co., The.

Pump Shafts, Monel Metal.
International Nickel Co., The.

Pumps, Hydraulic.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pumps & Pumping Mchy.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T.

Pushers, Coal.
Standard Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Rail Anchors.
Bethlehem Steel Co.
P. & M. Co., The.

Rail-Bonds.
American Steel & Wire Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Rail Braces — (See Braces, Rail).

Rail Reclamation Equipment.
Ryerson & Son, Joseph T.

Railroad Shops.
United Engineers & Constructors, Inc.

Rail Splice Plates — (See Joints, Rail).

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

Railway Signals.
General Electric Supply Corp.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Receivers, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

Recorders, Speed & Cut-off.
Valve Pilot Co.

Rectifiers for Signal Work.
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.

Reducing Valves.
Vapor Car Heating Co., Inc.

Reflectors, Headlight.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.

Refrigerators.
Wine Railway Appliance Co.

Regulators, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Relays.
General Railway Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Removers, Paint & Varnish.
Oakite Products, Inc.

Repair Parts, Stoker.
Standard Stoker Co.
Q & C Company, The.

Retorts, Creosoting.
Graver Tank & Mfg. Corp.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Ringers, Bell
Hammett, H. S.

Rivet Cutters.
Ingersoll-Rand Co.

Riveters, Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Riveting Machines.
Ingersoll-Rand Co.

Rivets.
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
Pressed Steel Car Co.
Russell, Burdsall & Ward Bolt and Nut Co.

Rods.
Neely Nut & Bolt Co.

Rolled Steel.
Carnegie Steel Co.

Roller Bearings—(See Bearings, Roller).

Rolls, Bending & Straightening.
Birdsboro Steel Foundry & Machine Co.

Roof Slabs, Concrete.
Federal American Cement Tile Co.

Roofing, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

Roofing, Buildings.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

Roofing, Car.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Lehon Co., The.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).
Tuco Products Corp.
Union Metal Products Co.

Roofing, Corrugated.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

Roofing, Tile.
Federal American Cement Tile Co.

Roofing, Tile, Cement.
Federal American Cement Tile Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Rope, Wire — (See Wire Rope).

Rust Preventatives.
Dearborn Chemical Co.
Oakite Products, Inc.

Safe Ends.
National Tube Co.

Sand Drying Plants.
Roberts & Schaefer Co.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, High Speed, Friction.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
Industrial Brownhoist Corp.
Q & C Co., The.

Scales.
Fairbanks-Morse & Co.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
Tuco Products Corp.

Seats, Car.
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Seats, Coach.
Brill Co., The J. G.

Shafting.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Standard Steel Works Co.

Shapers.
Ryerson & Son, Joseph T.

Shapes, Pressed Steel.
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

Shapes, Structural.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheds, Train.
American Bridge Co.
Inland Steel Co.

Sheets, Black and Galvanized.
Allegheny Steel Co.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Blue Annealed.
Allegheny Steel Co.

Sheets, Building, Special Car, Corrugated & Plain.
Armco Railroad Sales Co.

Sheets, Corrugated.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Carnegie Steel Co.
Johns-Manville Corp.
Ryerson & Son, Joseph T.

Sheets, Corrugated & Plain.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Electrical.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Iron & Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

Sheets, Locomotive Jacket.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.

Sheets, Polished or Planished Iron.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.

Sheets, Steel.
Armco Railroad Sales Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sherardising Plants.
General Electric Co.

Shop Calling Systems—(See Systems, Communication).

Shops, Railroad—(See Buildings, Iron, Steel and Steel Concrete).

Shovels & Draglines.
Industrial Brownhoist Corp.

Shovels, Steam, Gasoline & Electric.
Orton Crane & Shovel Co.

Siding, Iron & Steel.
Armco Railroad Sales Co.

Siding., Bldg., Car, Corrugated & Plain.
Kinnear Mfg. Co.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.

Siding, Corrugated & Plain.
Carey & Co., Philip, The.
Johns-Manville Corp.

Signal Accessories.
Electric Storage Battery Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Signals, Automatic Cab.
General Railway Signal Co.
Union Switch & Signal Co.

Signal Blades.
General Railway Signal Co.
Union Switch & Signal Co.

Signals, Crossing.
Union Switch & Signal Co.

Signals, Crossing Protection.
General Railway Signal Co.
Railroad Supply Co.

Signals, Railway.
General Electric Co.
Union Switch & Signal Co.

Sign Posts, Treated.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Signs, Highway Crossing.
Railroad Supply Co.

Silico Manganese.
Vanadium Corp. of America.

Slabs, Concrete Floor.
Federal Cement Tile Co.

Slag, Blast Furnace.
Carnegie Steel Co.

Slotting Machines.
Sellers & Co., Inc., Wm.

Slotting Machines, Locomotive Cylinder.
American Steel & Wire Co.

Sludge Removers.
Bird-Archer Co., The.

Soap, Liquid.
West Disinfecting Co.

Solder.
National Bearing Metals Corp.
Ryerson & Son, Inc., Joseph T.
Westinghouse Elec. & Mfg. Co.

Speed Indicators & Recorders.
Valve Pilot Corp.

Spelter—(See Zinc).

Spikes.
American Steel & Wire Co.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Splice Bars, Angle.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.

Spring Plates or Seats.
Allegheny Steel Co.
National Malleable & Steel Castings Co.
Union Spring & Mfg. Co.

Springs.
American Steel Foundries Co.
American Steel & Wire Co
Baldwin Locomotive Works The.
Pittsburgh Spring & Steel Co.
Railway Steel Spring Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Switch & Signal Co.

Springs, Shop Equipment.
Ryerson & Son, Joseph T.

Springs, Vanadium Steel.
Pittsburgh Spring & Steel Co.
Union Spring & Mfg. Co.

Stacks, Steel.
American Bridge Co.
Graver Tank & Mfg. Corp.

Stands, Switch & Target.
Q & C Co., The.

Staybolts.
American Locomotive Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Staybolts, Hollow.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Steam Chests.
Franklin Railway Supply Co., Inc.

Steam Enclosures, Corrugated Iron.
Republic Steel Corp.

Steam Shovels.
Orton Crane & Shovel Co.

Steel Alloy.
Illinois Steel Co.
Ryerson & Son, Joseph T.
Republic Steel Corp.
Standard Steel Works Co.

Steel, Firebox.
Carnegie Steel Co.
Illinois Steel Co.

Steel & Iron, Stainless.
Allegheny Steel Co.

Steel, Open Hearth.
Carnegie Steel Co.
Illinois Steel Co.

Steel Plate Construction.
Graver Tank & Mfg. Corp.

Steel, Pressed Specialties.
Hale-Kilburn Co.

Steel, Structural.
American Bridge Co.
Carnegie Steel Co.
Graver Tank & Mfg. Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Steel, Tool.
Illinois Steel Co.
Midvale Co., The.
Q & C Co., The.
Ryerson & Son, Joseph T.

Step Joints.
Q & C Co., The.
Rail Joint Co.

Steps, Car—(See Car Steps, Safety).

Stokers, Locomotive.
Standard Stoker Co.

Stokers, Mechanical.
Westinghouse Elec. & Mfg. Co.

Stoker Repair Parts.
Standard Stoker Co.

Storm Sewers, Corrugated Iron.
Republic Steel Corp.

Strainer, Air.
Westinghouse Air Brake Co.

Strainers, Tank Hose.
Prime Mfg. Co., The.

Stringers, Bridge, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Structural Shapes, Rolled Shapes.
Carnegie Steel Co.

Superheaters.
Superheater Co., The.

Supports, Bottom Rod Safety.
Chicago Railway Equipment Co.

Switch Boards.
Graybar Electric Co.
Johns-Manville Corp.
Westinghouse Elec. & Mfg. Co.

Switch Machines.
General Railway Signal Co.

Switch Movements.
Union Switch & Signal Co.

Switch Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Switches, Electric.
Electric Service Supplies Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Switches & Switch Stands.
Ramapo Ajax Corp.

Syphons, Corrugated Iron.
Republic Steel Corp.

Syphons, Locomotive.
Locomotive Firebox Co.

Syphons, Locomotive, Bottom
Locomotive Firebox Co.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tamping Machines, Tie.
Ingersoll-Rand Co.

Tamping Outfits, Tie.
Ingersoll-Rand Co.

Tank Cars.
Indian Refining Co.

Tanks, Acetylene, Gas.
Oxweld Railroad Service Co., The.

Tanks, Air, Gas, Oil and Water.
Baldwin Locomotive Works, The.
Graver Tank & Mfg. Corp.

Tanks, Water.
American Bridge Co.
American Locomotive Co.
National Tube Co.
Pressed Steel Car Co.
Westinghouse Air Brake Co.

Tape, Insulation.
Johns-Manville Corp.
Okonite Co., The.
Westinghouse Elec. & Mfg. Co.

Taps, Staybolt.
Ryerson & Son, Joseph T.

Tele. & Tele. Wire.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Terminals, Railroad.
United Engineers & Constructors, Inc.

Testers, Boiler.
Sellers & Co., Inc., Wm.

Testers, Gage.
Ashton Valve Co.

Testers, Rail.
Sperry Products, Inc.

Testers, Staybolt.
Flannery Bolt Co.

Testing Machines.
Baldwin-Southwark Corp.

Thermostats.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.

Tie Plates.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Company
Railroad Supply Co.

Ties, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Ties, Steel.
American Bridge Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Tile, Cement, Concrete.
Federal American Cement Tile Co.

Timber, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber Co.
Southern Wood Preserving Co.
Wood Conversion Co.

Tires.
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.
Goodrich Rubber Co., B. F.

Tires, Steel.
Edgewater Steel Co.
Midvale Co., The.
Railway Steel Spring Co.
Standard Steel Works Co.

Toilet Papers
U. S. Envelope Co.

Tools, High Speed Steel.
Bethlehem Steel Co.
Bird-Archer Co., The.

Towers, Floodlight.
Pyle-National Co.

Track Skates.
Q & C Co., The.

Tractors.
Caterpillar Tractor Co.
Elwell-Parker Electric Co.
Industrial Lumber Co.
International Creosoting & Construction Co.

Tractors, Industrial.
Elwell-Parker Electric Co.
International Harvester Co.

Tractors, Turntable.
Nichols & Bro., Geo. P.

Train Control Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Tramways, Wire Rope.
American Steel & Wire Co.

Transfer Tables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bro., Geo. P.

Transformers.
General Electric Supply Corp.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Trap Doors.
Edwards Co., O. M.

Trap Doors & Fixtures.
Tuco Products Corp.

Traps, Steam.
Johns-Manville Corp.

Treads, Bridge Floor.
Carnegie Steel Co.

Treads, Safety.
Ryerson & Son, Joseph T.

Treatment Water—(See Water Softening and Purifying).

Truck Frames—(See Frames, Truck).

Trucks, Oxy-Acetylene Supply.
Oxweld Railroad Service Co., The.

Trucks, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bettendorf Company, The.
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Flexible Truck Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Standard Car Truck Co.
Symington Co., The.

Trucks, Cast Steel Tender.
General Steel Castings Corp.

Trucks, Cast Steel, Electric Car.
General Steel Castings Corp.

Trucks, Cast Steel, Car and Locomotive.
General Steel Castings Corp.

Trucks, Electric Storage Battery.
Elwell-Parker Electric Co.

Trucks, Industrial.
Elwell-Parker Electric Co.

Trucks, Motor.
Dodge Motor Truck Corp.
General Motors Truck Co.
International Harvester Co.
Reo Motor Car Co.
White Co., The.

Trucks, Tender.
Flexible Truck Co.

Trucks, Trailer.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.

Tubes, Arch.
National Tube Co.

Tubes, Boiler.
Allegheny Steel Co.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Globe Steel Tubes Co.
National Tube Co.
Ryerson & Son, Joseph T.

Tubes, Boiler, Charcoal Iron.
Bethlehem Steel Co.
Reading Iron Co.

Tubes, Staybolt.
Falls Hollow Staybolt Co.

Tubes, Tire.
Firestone Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tubing.
Aluminum Co. of America.

Tubing, Seamless Steel.
National Tube Co.

Tungsten Metal.
Vanadium Corp. of America.

Turbo Generators.
Electric Service Supplies Co.
General Electric Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Turnbuckles.
American Bridge Co.
American Steel & Wire Co.
Ryerson & Son, Joseph T.

Turntable Tractors.
Nichols & Bro., Geo. P.

Turntables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bro., Geo. P.

Typewriter Ribbons.
Remington-Rand Business Service.

Typewriters.
Remington-Rand Business Service.

Uncoupling Device.
Hutchins Car Rfg. Co.

Undercrossings, Corrugated Iron.
Republic Steel Corp.

Underfloor Duct.
General Electric Supply Corp.

Underfloor Duct, Fibre and Metal.
Johns-Manville Corp.

Underframes, Cast Steel, Tender.
General Steel Castings Corp.

Underframes, Cast Steel, Freight Car.
General Steel Castings Corp.

Underframes, Steel.
Bettendorf Co., The.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Underground Conduit.
General Electric Supply Corp.

Upholstery, Car.
Brill Co., The J. G.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Valve Caps.
Schrader's Son, Inc., A.

Valve Gears, Locomotive.
Pyle-National Co.

Valves, Air Brake.
Westinghouse Air Brake Co.

Valves, Back Pressure Acetylene.
Oxweld Railroad Service Co., The.

Valves, Balanced Slide
Hammet, H. G.

Valves, Blow-Off.
Bird-Archer Co., The.

Valves, Check & Angle Steam
Sellers & Co., Inc., Wm.

Valves, Drifting.
Ardco Mfg. Co.
Sellers & Co., Inc., Wm.

Valves, Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Valves, Piston.
Franklin Railway Supply Co., Inc.

Valves, Pop, Safety & Relief.
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Valves, Pressure Regulating.
Gold Car Heating & Lighting Co.

Valves, Throttle.
American Throttle Co., Inc.
Bradford Corporation.

Valves, Fire.
Schrader's Son, Inc., A.

Varnish Powder.
Aluminum Co. of America.

Varnishes.
General Electric Supply Corp.
Lowe Bros. Co., The
Sherwin-Williams Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Ventilators, Car.
Gold Car Heating & Lighting Co.

Ventilators, Shop & Roundhouse.
Carey Co., Philip, The.
Johns-Manville Corp.

Wardrobes, Rolling and Disappearing Front — (See Lockers).

Washers.
National Malleable & Steel Castings Co.
Ryerson & Son, Joseph T.
Wine Railway Appliance Co.

Washers, Boiler.
Sellers & Co., Inc., Wm.

Waterproofing Materials and Compounds.
Carey Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

Water Purifying Materials & Compounds.
Bird-Archer Co., The.
Dearborn Chemical Co.

Water Softening & Purifying.
Bird-Archer Co., The.
Dearborn Chemical Co.
Graver Tank & Mfg. Corp.
Permutit Co., The.

Weather Stripping.
Tuco Products Corp.

Wedges, Automatic.
Franklin Railway Supply Co., Inc.

Wedges, Journal Box.
American Steel Foundries.
Gould Coupler Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Symington Co., The.

Weed Killer.
Q & C Co., The.

Welding Machines, Acetylene.
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Westinghouse Elec. & Mfg. Co.

Welding Machines, Electric.
General Electric Co.
Ryerson & Son, Joseph T.

Welding Machines, Flue.
Ryerson & Son, Joseph T.

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Franklin Railway Supply Co., Inc.

Welding Process.
Oxweld Railroad Service Co.

Welding Rods.
American Steel & Wire Co.
General Electric Supply Corp.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.

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Oxweld Railroad Service Co., The.

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American Steel Foundries.
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Birdsboro Steel Foundry & Machine Co.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

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American Steel Foundries.
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Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
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Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

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Carnegie Steel Co.
Edgewater Steel Co.
Mt. Vernon Car Mfg. Co.
Standard Steel Works Co.

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Illinois Steel Co.
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Lima Locomotive Works.
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American Steel & Wire Co.

Wire, Insulated.
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Graybar Electric Co.
Kerite Insulated Wire & Cable Co.
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Graybar Electric Co.

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American Steel & Wire Co.

Wire Rope.
American Steel & Wire Co.

Wire, Telephone & Telegraph.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
Graybar Electric Co.

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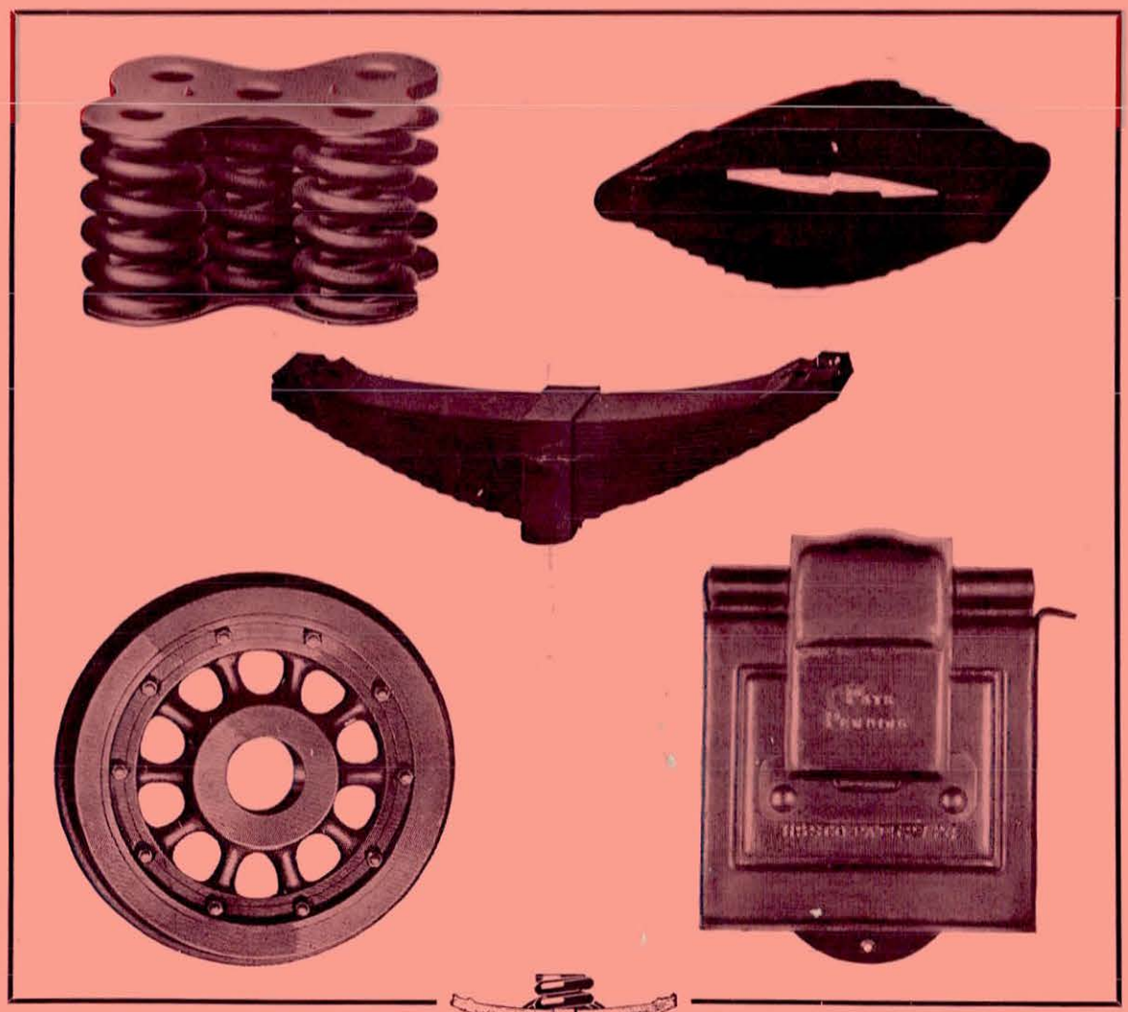

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